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OORE'S RURAL MANUALS.---No. I.

A MANUAL OF

FLAX CULTURE

AND MANUFACTURE:

EMBRACING FULL DIRECTIONS FOR

PREPARING THE GROUND, SOWING, HARVESTING, &c.

FLAX PLANT.

HEMP PLANT.

ALSO, AN ESSAY BY A WESTERN MAN, ON

HEMP AND FLAX IN THE WEST:

MODES OF CULTURE, PREPARATION FOR MARKET, &c.

WITH BOTANICAL DESCRIPTIONS AND ILLUSTRATIONS.

PUBLISHED BY D. D. T. MOORE,
EDITOR OF MOORE'S RURAL NEW-YORKER,
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1863.

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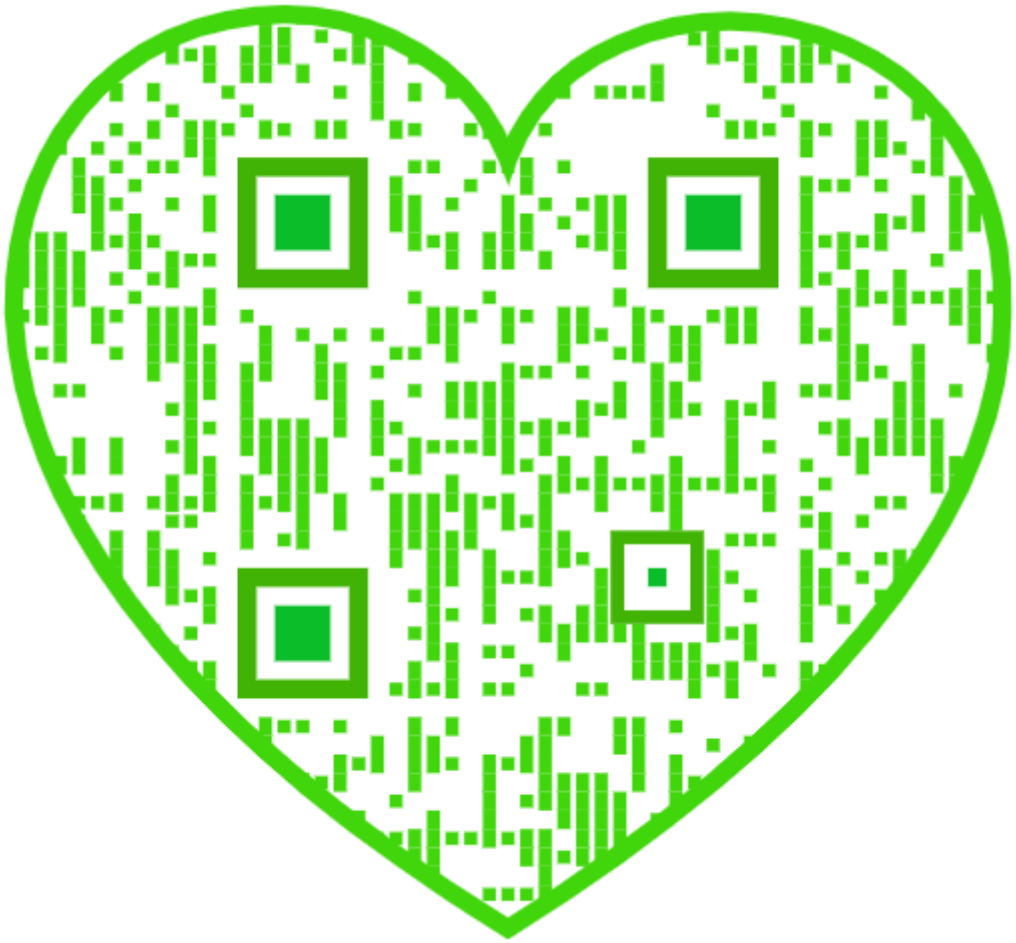

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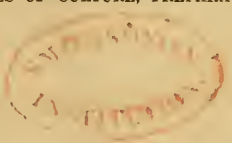

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Entered according to Act of Congress, in the year 1863, by
D. D. T. MOORE,
In the Clerk's Office of the District Court of the United States for the
Southern District of New York.

EXPLANATORY PREFACE.

THIS little Manual is designed to supply the wants of thousands who are seeking information on the subjects discussed in its pages,—and especially those about entering upon Flax or Hemp culture, from patriotic motives, yet who very properly desire to render the business profitable. The demand for Flax fiber, for various purposes, is constantly augmenting, and it is believed that, whether the War for the Union be of short or long duration, both Flax and Hemp may profitably be grown in many localities of the Loyal States and Canadas for years to come; and that it is the DUTY of those favorably situated for the production of either to try the experiment. The unholy rebellion of the Southrons has dethroned "King Cotton," for years, at least, causing a great demand for a suitable substitute, (and particular need of considerable *hemp*,) and we believe the extensive cultivation of Flax—with the discovery of a cheap, efficient and speedy process of "cottonizing" the same—will render the dethronement permanent, without seriously affecting the material interests of either the People or the Country.

The primary aim of this work is to furnish *practical* and *reliable* information concerning Flax and Hemp Culture, and upon the best modes of securing and preparing these important staples (as they are now becoming) for a remunerative market. The various inquiries we have received on the subject within the past few months, and the very general demand for a Guide which will enable new beginners to enter upon Flax Culture without fear of failure, has induced this attempt to supply what was considered an important desideratum in the Rural Literature of the Country,—for there was no American work on the subject containing the necessary details and information. Lacking the practical knowledge of flax growing which would enable us to write what was wanted, and finding no one person willing to undertake (on short notice and in a brief space of time,) the whole subject of Culture, Manufacture, &c., we applied to different parties for assistance, and give the result in subsequent pages,—a result far more satisfactory than was anticipated in the outset; for, on perusing each Essay carefully, we can freely say that we have rarely found more valuable and practical information on any one subject in an equal amount of space. Most of the papers given were written during the first two weeks of April, and the authors had no opportunity to compare notes and experiences,—

as we were obliged to publish at the earliest practicable moment,—yet we think few discrepancies will be apparent, even to the critical reader or reviewer.

The first Essay is from the pen of an eminently practical Flax Grower, who has had over thirty years experience in the business, and consequently knows whereof he affirms. We therefore give his contribution the post of honor. The paper on "Flax Culture and Manufacture in the United States and Great Britain," (written in March last for the RURAL NEW-YORKER, and now in course of publication in that Journal,) is also from the pen of a gentleman of large experience, who has had superior opportunities and facilities for acquiring information on the subjects so ably treated. The Report of the Committee of the N. Y. State Agricultural Society will be read with much interest at the present time, and, though not as practical as the papers above alluded to, contains much valuable information, especially relative to machinery for manufacturing Flax Cotton, and is considered worthy of being placed upon record. Mr. BRAGDON'S paper on "Hemp and Flax in the West," was furnished in some haste, yet seems to cover the whole ground, and must prove of especial interest and value to those for whose benefit it was mainly prepared—the Farmers of the West. Mr. WILLIAMS' article on "Flax Growing in Seneca Co., N. Y.," will also prove instructive, while Maj. BROOKS' essay on "Flax as a Domestic Institution," will have a salutary influence, and its humor promote digestion. Mr. PHIN'S article on the "Structure of Textile Fibers," exhibits much knowledge, as well as careful research and investigation, and will prove very acceptable to those seeking information on the points embraced. Last, yet not least, Prof. DEWEY gives the Botanical Descriptions of the Flax and Hemp Plants—imparting, briefly and lucidly, just what those who cultivate either ought to understand, if they do not already.

Though mainly devoted to Flax *Culture*, space is appropriately occupied in treating upon the *Manufacture* of Flax, machinery for cottonizing the same, and the structure of various fibers. We have not, however, attempted to notice or describe the many machines of recent invention, and which have not yet been satisfactorily tested. Perhaps we may hereafter enter upon this branch of the subject in a revised and enlarged edition, after time has been given for thorough experiments and the consequent accretion of definite information.

This may not be in the proper style of a Preface, but it is in such shape as an overworked Editor and Publisher hurriedly pens and respectfully submits to the Reader. If the Manual shall prove of service to those it is designed to aid, thereby promoting the material interests and prosperity of the People and Country, our object will be attained; and, moreover, if the work meets the approval of the intelligent and discriminating, we shall be gratified with this effort to facilitate the progress of an important branch of productive industry.

A PRACTICAL ESSAY ON FLAX CULTURE.

BY WILLIAM NEWCOMB, OF RENSSELAER COUNTY, N. Y.

INTRODUCTORY.

It is hardly necessary at this time to impress upon the public mind the paramount importance of Flax Culture, as the farmers throughout the country appear to realize it, not only from its necessity to the prosperity of the great North, but also from the large and remunerative profits it may afford to those intelligently engaged in the production and manufacture of an increasingly valuable staple. Without further introduction, therefore, I propose—after having had long experience, and making many experiments—to give the results attained; or, in other words, a few practical remarks on the Culture of Flax, especially with reference to the preparation of the soil for the reception of the seed, and its after management.

SOIL AND SITUATION.

The first requisite in Flax Growing is to have a good soil, in a suitable situation. On the alluvial soil on the banks of rivers or smaller streams, Flax will not succeed. Mildew or rust almost invariably destroys both the seed and stem, or hurl. All high or elevated lands that will produce good corn, if not sands, will produce good Flax with proper cultivation. Flax does not succeed well on a sward ley, but ought to be sown after some hoed crop of the previous year. It does not bear manuring with barn-yard manure the season it is sown. The seed must be good and free from foul seeds.

PREPARING THE LAND AND SOWING.

The land can scarcely be too finely pulverized before sowing. If plowed when wet no after cultivation can remedy the evil. The earlier the land can be plowed, after it is in a suitable condition, the better prospect of a good crop. Drag or harrow the ground thoroughly *before* the seed is sown, and as lightly as possible, and only once *after* it is sown. The heaviest crop I ever raised was in a sixteen acre lot, which was not dragged at all after it was sown, but washed in by a heavy shower and continuous rains for several days until the seed had sprouted.

There are several rules as regards the time of sowing Flax seed. One of them is, when the forest trees begin to put forth their young leaves. Another is, the first week in May. But the safest rule is when your soil is in good condition to work, and the danger from severe frosts has passed. After the Flax is up and has two well-formed leaves there is not much danger from frost, as it is seldom injured by frost in this stage of the plant. I have known Flax injured by frost when first coming out of the ground.

AMOUNT OF SEED -- FERTILIZERS.

One bushel of seed to the acre is fully sufficient if the object is to obtain seed and lint united — a less quantity if for seed alone, and perhaps a little larger quantity of seed if the lint only be desired. The seed is usually sown by hand, and ought to be scattered evenly over the ground.

Machine sowing I have never tried, but have no doubt it could be profitably done. Any method will answer in sowing the seed if it be done in such a manner as to get it evenly on the ground.

The labor of getting in a crop of Flax is about the same as getting in a crop of oats. I have found great benefit resulting to the crop by using the following as a fertilizer:—One bushel Plaster, one bushel Ashes and one bushel Fine Salt, per acre — mixed and sown on the Flax as soon as it is out of the ground. This stimulates the growth, adds to the strength of the stem, and increases the quality and quantity of the seed. It is assumed that the land is free of weeds, or nearly so, as they always lessen every crop, and especially the Flax crop.

HARVESTING OR PULLING THE CROP.

Harvesting or Pulling the Flax is the next and the most laborious part of Flax raising. The time to pull the Flax is when the lower leaves of the stem begin to droop, or when two-thirds of the bolls have turned brown. As it takes some time to gather a large crop, it is well to begin a little too early, as the Flax deteriorates in quality as well as quantity, aside from the loss of seed by the shelling out and dropping of the bolls.

Various experiments have been tried in gathering this crop by machinery, but as yet all that have come to my knowledge have proved failures, and I fear this will be the case in future, as difficulties have to be overcome that seem to me to be almost insurmountable. Any machinery that crushes the stem, near its center, in pulling the Flax, injures it more than the expense of hand-pulling. Again, if weeds grow they are pulled with the Flax, which injures the after management. The Flax is pulled and bound with the Flax in handfuls convenient to handle in thrashing it, laid on the ground during the day, and then stood in shocks of eight handfuls, or eight of the small bundles made in pulling it. This will make a convenient size for a sheaf.

Flax should not be allowed to remain longer in the field than is necessary to cure it, when it should be housed. Great loss has been sustained by a little negligence in this respect. Machinery has been made tolerably well adapted to getting off the seed; but, from close observation, and by practical experiments, I do not think any saving has been reached in this direction. A good hand will whip off the seed from an acre in two days, and some much sooner. A large, rough-surfaced stone, or even a plowshare, is used to whip the seed from the Flax.

METHODS AND TIME OF ROTTING.

The next process is the rotting. There are two methods. One is by water, called WATER-ROTTING. This method has not been very extensively practiced in this country. It does not increase the quantity, nor quality, except for special uses. This method of rotting is variously accomplished; but the only one adapted to the Farmer is putting the Flax in some pond or pool of water, and placing sufficent weight upon it to completely immerse it,— and here no rule as to time can be given, as I have had Flax fully rotted in five days, and I have had Flax in the same pit or pond thirty-two days, and then insufficiently rotted. The judgment alone can be depended on. When the hurl will slip entirely from the stem by drawing it between the finger, is good evidence of its being sufficiently rotted. It must then be taken from the pond and spread on the land to dry, and when dry taken up and secured. One great desideratum is to keep the Flax even in all stages of its handling.

The other process of rotting is termed DEW-ROTTING. This process is much more simple. The Flax is drawn on a meadow, and if it is low land, the better. It should be spread evenly and thinly, for if care is not taken to do this no after management can remedy the loss. The last of September and fore part of October is the best part of the year to perform dew-rotting. It seldom rots well in the spring of the year. If the weather be warm and wet it soon rots sufficiently — from seven to twelve days; if dry and cool, it takes a much longer time, and the Flax may need turning over a few days before it is taken up. It may easily be known when sufficiently rotted by its color being changed, and by taking a few spears in the hand and breaking them. If the fiber readily separates from the woody part of the Flax it will do to take up and house. Even in this great care must be taken that the Flax is dry, and when dry no time should be lost in securing it.

THE TAKING UP OF FLAX can be greatly facilitated by raking it, or by taking it up by hand in suitably sized sheaves, and standing it

up, even though it should be damp, as it dries rapidly when in this situation.

This is usually as far as the Farmer takes charge of the crop, as it is now fitted for the mill, or for scutching. In fact, most of the Farmers dispose of Flax to the mill owners, who dress the Flax as soon as it is pulled in the field. A good flax-puller will average one acre of Flax in three days, in pulling and setting up. An expert hand will get off the seed of an acre in two days, and spread, and take up and bind, an acre in two days more.

YIELD OF FLAX.

The average yield of Flax in this county for the last thirty years, would scarcely reach two hundred and fifty pounds of lint and eight bushels of seed to the acre. Some seasons the average yield has reached four hundred pounds of lint and twelve bushels of seed, but these have been seldom. We hear and read of corn crops yielding one hundred and twenty bushels of shelled corn to the acre, but where is the Farmer that expects anything like that yield when he plants his corn? If he gets one half of that quantity weighed in February, he certainly has an extraordinary crop.

VALUE OF THE FLAX CROP.

The average price of Flax has heretofore been about ten cents per pound, and seed about one dollar and fifty cents per bushel; but the past season the Flax has brought the average price of twenty-five cents per pound, and the seed from three to four dollars per bushel. Clean seed for sowing is now bringing from four dollars and fifty cents to five dollars per bushel.

It is characteristic of American Farmers to try new things and run to extremes, and disappointment is frequently the result. It is not often that Flax seed brings four dollars per bushel, and dressed Flax twenty-six cents per pound, as it does now, and it would be folly for any farmer to expect to realize such prices for any length of time; yet the Flax crop is destined to become one of the staple productions of this State. I consider it one of the *least exhausting crops we raise;* yet Flax will not do well *after Flax*, unless the ground be *highly manured with well rotted compost.* I have known six good crops of Flax raised on the same ground in seven years—a corn crop being taken off the fourth year. The experiment has been tried by sowing three and four bushels of seed to the acre, and in every instance a perfect failure; and if it could be raised successfully, we should have to seek a foreign market, as we have no manufactories in this country that would require the crop or could pay a remunerative price for it. It matters but little to the manufacturer of fine laces whether he pays five or ten dollars per pound for his Flax, when the product from a single pound would exceed four thousand dollars. Not so with our manufacturers, when the highest result does not exceed a dollar and a half per pound, and only one manufactory in the United States that does that. I trust it will be a long time before this country will require the laboring classes to work for ten cents per day and board themselves. It is a difficult matter to correctly estimate Flax—the value thereof by bulk or weight. I have known a tun of rotted Flax produce only one hundred pounds of lint, and I also have known one tun of Flax to produce five hundred pounds of lint. These are probably the extremes. The largest reliable crops of Flax raised have not exceeded six hundred pounds of lint and sixteen bushels of seed. The past season has been an unusual one, both as to the large average yield of lint and the extraordinary price it has brought. The expense to the farmer in having his Flax dressed at the mills averages two and a half dollars per hundred pounds.

PREPARING FLAX FOR MARKET.

We now come to the last process—PREPARING THE FLAX FOR MARKET. There have been many experiments in producing machinery for this purpose. At one time it was claimed that a machine, or machines, had been invented to dress the Flax without making any tow, but these have all proven failures. Formerly the hand-brake and long wooden hand-knife were used, but this process was too slow and laborious. Then the wooden brake, driven by water power, and iron knives on a shaft, also driven by water power, were introduced; and now the cast-iron brake, with some improvement in the knives, is almost universally used. It is true that recently brakes have been introduced that claim to do away with the necessity of making any coarse tow. I trust they may prove a success. As they are expensive, unless there is some decided

advantage in them they will not be generally introduced.

AMOUNT AND VALUE OF FLAX TOW.

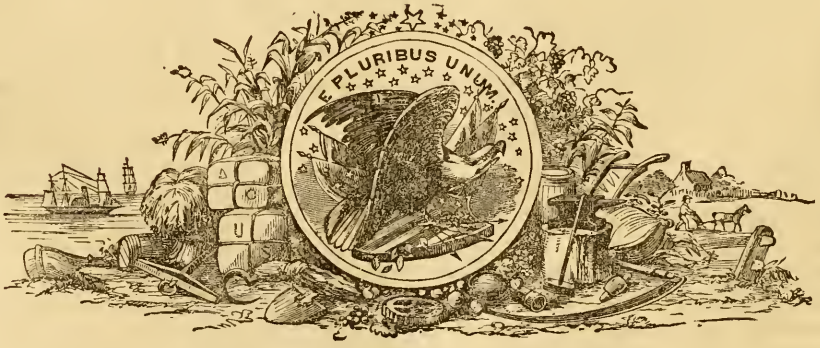
The amount of tow produced in the dressing of Flax varies according to its quality. I may say that from twenty to fifty per cent. are the extremes. That is, for every hundred pounds of dressed Flax there will be from twenty to fifty pounds of coarse and fine tow. This article has ranged exceedingly high the past season — the coarse tow bringing from one dollar and a half to two dollars per hundred pounds. The fine tow sells for from six to eight dollars per hundred pounds.

CAUTION TO NEW BEGINNERS.

And here I cannot repress the firm conviction on my mind that a few words of caution ought to be given to new beginners, not to enter too largely at first upon the Flax Culture. There is much that must be learned *practically,* and the general excitement that now exists may induce many to go beyond their ability in securing the crop. I do not think, however, that there is any prospect of over-stocking the market. We now import very large quantities of Flax for home consumption. And one other caution. The European culture of Flax, as far as it has been tried in this country, has proved an entire failure. I have had five men work a whole day in dressing an acre of Flax on which four bushels of seed had been sown, with a result of only thirty-six pounds of Flax, and the Flax itself not worth more than the fine waste in dressing other Flax.

CONCLUSION.

In conclusion, it is proper to add—what should perhaps have been said when speaking of soil and situation—that Flax seed, if covered deeply, will not germinate and grow in our ordinary soils. Wet, tenacious soils will not produce Flax, nor any other crop successfully. No adhesive soils should ever be worked when wet, either for this or any other crop.



FLAX CULTURE AND MANUFACTURE

IN THE UNITED STATES AND GREAT BRITAIN.

BY N. GOODSELL, OF OSWEGO COUNTY, NEW YORK.

I.—PREFATORY.

Eds. Rural New-Yorker:—I have this day received the first ten numbers of your valuable paper for 1863, and have been looking over them to find what subjects were considered most interesting to your readers at this time, judging from the frequency of communications. My first attention was directed to "*Draining*," but I found that a set of numbers were already commenced on that subject, and as the country had been pretty well drained (of men and specie) for the last two years, I thought I would leave that matter to be discussed by wiser heads.

It then occurred to me that there was not as much flax and hemp used in this country as there ought to be, and as I considered we were half a century behind most other civilized nations in the manufacture of these products, more particularly so with regard to flax, I would offer to give you a few numbers on that subject, if they would be acceptable, commencing with the management of flax after it has been pulled and the seed taken from it, and I make this offer with more confidence as the Committees of Congress for the years 1825 and 1830,—who were appointed to investigate and report upon the manufacture of hemp and flax,—made their reports mostly from communications made by myself, from my own experiments, and knowledge gained from other reliable sources.

During the years 1821, 1822 and 1823, there was quite an excitement in this country on the cultivation and manufacture of hemp and flax, and the Agricultural community flattered themselves that our Government were about to do something to encourage this branch of industry, but they were disappointed, and after many speeches were made in Congress, and in State Legislatures, mostly of the "buncombe" order, the thing died away and went to the tomb of the Capulets, since which cotton became King, and we have heard little said about hemp and flax.

At this time, owing to many existing circumstances, it does appear that the cultivation and manufacture of flax may be made profitable to the farmer, manufacturer, and the community at large, for many years to come, and as there are many erroneous opinions prevalent with us on this subject, I propose to send you a few articles to substantiate the following propositions:

First—That the soil and climate in many parts of the United States is favorable for producing a good growth of flax.

Second—That flax which has been allowed to ripen its seed is capable of being wrought into the finest fabrics.

Third—That flax is capable of being spun by machinery at less expense than cotton.

Fourth—That the process of dew-rotting flax, beside reducing the product more than twenty-five per cent., renders it comparatively worthless for the manufacturer.

I shall not attempt giving directions for sowing and harvesting the crop, taking it for granted that every man claiming to be a farmer understands that part of his business as well as raising corn or potatoes. N. GOODSELL.

New Haven, Oswego Co., N. Y., March, 1863.

REMARKS.—Many of our readers will recognize Mr. GOODSELL as an Agricultural Editor twenty-five or thirty years ago, and will be glad to find that he not only "still lives," but can wield the pen as well as of yore. Of course, we shall be glad to receive and publish the proposed series of articles, and have no doubt they will be read with interest and profit by thousands of our readers.—ED. RURAL NEW-YORKER.

II.—PRODUCT OF FLAX PER ACRE.

EDS. RURAL NEW-YORKER:—In my communication to you I proposed to substantiate certain propositions there laid down, with regard to the cultivation and manufacture of Flax in the United States.

As I have not been a contributor to your paper, and unknown to most of the readers of your journal, and in pursuing the objects proposed shall advance positions founded on my own observations, many may wish to know what opportunities I have had for making such observations, or whether I have borrowed my ideas from books, without the advantage of a practical education. I was born in the State of Connecticut, and my father was what was called in those days a substantial farmer, who kept his youngest son, myself, at home, in order to make a farmer of me. In the year 1800 he purchased a farm in Western New York, and the winter following moved on to it. Among crops cultivated by my father on his farm, he was careful to sow flax enough for the use of the family and some for sale. I have at this time distinct recollection of the crop of three acres, raised by him in 1797, which produced over 600 pounds to the acre. This, I think, was as fine a crop as he ever raised during my minority.

As early as 1821-2 I engaged in my experiments in rotting, dressing, and bleaching flax, and during those experiments I produced some as fine flax-cotton, as it is now called, as I have ever seen. This was accidental, as I was trying different methods to bleach the raw material before it was spun. I had soaked some flax for several days in a strong solution of super-carbonate of potash, then passed it into a bath of diluted sulphuric acid, and you may judge of my disappointment when I found my fine, straight fiber converted into a mass of tow. I considered this a perfect failure; and the cause, the fibers, which are minute tubes, having become filled with the solution of super-carbonate of potash, which, coming in contact with the solution of sulphuric acid, was decomposed, and carbonic acid set at liberty in such quantities as to burst the fibers all to pieces, and, as I then supposed, rendering it perfectly worthless.

After pursuing experiments for a couple of years, and not satisfied with what information I could get in this country, I concluded to visit Ireland, which I then supposed was fifty years in advance of us in the manufacture of flax. Having learned that the British Government had established a Linen and Hempen Board in Ireland for the encouragement of the Cultivation and Manufacture of Flax, through which Board they distributed annually about $100,000 as premiums for any improvements made in the cultivation or manufacture of Flax or Hemp, I thought that was the place to get information. In 1823, having procured letters of introduction to the Officers of this Board, I proceeded to Dublin, and to the Linen Hall, where they held their meetings. I was politely received by the Officers of the Board, who offered to give me any information they possessed on this subject, and kindly tendered me the free use of their Library and papers, to make such extracts from as I might wish.

On my arrival in Ireland I found the cultivation of flax in what may be called a *transition state.* It appeared that the officers of this Board had become convinced of the superiority of the Dutch method of preparing flax over their own, and in 1822 they sent PETER BERNARD, Esq., Inspector General for Leinster, Munster, and Connaught, into the Netherlands, in order to ascertain the reasons for the superiority of Dutch flax. Previous to this time the same prejudice had prevailed in Ireland that had in this country, viz., that flax, which had produced seed, could not be manufactured into fine linen.

In Mr. BERNARD'S report he says:—"Why so

general an opinion as has prevailed in Ireland for a series of years, that flax which gives seed is not adapted for her fine linens, should have taken place, I cannot conjecture."

Again, speaking of an establishment at Antwerp, he says:—"I called at the manufactory and purchased a small quantity of yarn for the inspection of the Honorable Board, and which is sold at the rate of £47,786, 13s. 4*d.* per tun. I was presented with two skeins of yarn, which I brought home with me, the finest of which I was told was worth $108 per pound in the market at Antwerp." All these yarns, Mr. BERNARD assured me, were from flax which had *produced seed.*

After the Linen and Hempen Board had received Mr. BERNARD'S Report, they issued circulars offering liberal premiums for every acre of flax that should be allowed to ripen its seed. This put an end to our market for flax seed for Ireland, which, under the erroneous prejudice that flax producing seed was not capable of being manufactured into fine fabrics, had grown into an extensive trade.

Now, as regards my first proposition, viz., "that the soil and climate in many parts of the United States are favorable for producing a good growth of flax." From my own observations I can say that I have seen as fine flax grown in the States as I saw in Ireland. As regards the quantity of flax produced, per acre, in Ireland, MARSHALL, in his Report to the Linen and Hempen Board in 1817, gives the average quantity per acre, in Ireland, at 500 pounds. If your readers will examine the Reports of our Agricultural Societies, for the last thirty years, and add to these reports twenty-five per cent. for the difference between dew-rotted and water-rotted flax, it would give at least fifty per cent. in our favor in the growth of flax. So much for my first proposition. My second in your next. N. GOODSELL.

III.—DRESSING AND SPINNING FLAX.

EDS. RURAL NEW-YORKER:—In my programme, laid down with regard to the manufacture of flax, my second proposition was to show that flax that had ripened its seed was capable of being wrought into the finest fabric.

In number 11 of your present volume, on page 86, I find a communication over the signature of S. W., in which I find that he still adheres to our former prejudice, for he says:—"To grow flax for lint, it should be sown much thicker, and pulled before the seed has well ripened, *as they do in Ireland.* The Irish farmers sow imported seed. Water-rotting is the true process for preparing flax for lint, but the very little grown in this country for domestic use is generally dew-rotted."

Now, I agree with S. W. in many of his positions, viz., that in raising flax for lint, it should be sown thicker than when cultivated for seed, for several reasons. First, it is found that when sown thick the size of the fiber is smaller than when sown thin for seed, and the length and quantity, as well as quality, increased, and that water-rotting is the true process for preparing flax for lint. In his position, that the Irish at this time pull their flax before the seed is ripe, or depend upon foreign seed for sowing, I may be allowed to differ, but admit that this was formerly the case. Since the return of Mr. BERNARD from the Netherlands, and the offer of premiums by the Linen and Hempen Board of Ireland for every acre of flax that should be allowed to ripen its seed, I think very little foreign seed has been used in that country.

With regard to sowing thicker for lint, allow me to give a communication which was made to me in 1831, by a practical farmer of Pembroke, Genesee county, N. Y. He says:

"I have, for a few years past, made some some experiments in the growing and preparation of flax, and believe, from my own experience, that the Irish mode is decidedly the most advantageous for this country. Water-rotted flax is vastly superior, when the process is performed in water of proper quality; but I think the water of *Old Genesee* generally too hard to produce a first-rate article." (The water of Genesee county is mostly strongly impregnated with lime.) "Last year I exposed my crop to the equinoctial rain, and in five days the rotting process was finished, and a better article of the *kind* I have never seen in this country. Our farmers, generally, have imbibed very erroneous notions with regard to the proper quantity of seed to be sown on an acre. From one to two

bushels is the common quantity sown. This renders the crop coarse and harsh like hemp. I sowed last year eight bushels per acre, and received at the rate of twelve hundred pounds per acre, of first-rate flax. The ground was in fine order, and the crop pulled when about two-thirds the capsules were formed."

Now, if we add to the above reported crop twenty-five per cent. for the increase by water-rotting, this would show an enormous crop, as compared with Marshall's Report to the Linen and Hempen Board as the average crop of Ireland,—and if to this we add twenty-five per cent. more for the difference in preparing flax for market, in the two countries, (which I shall allude to hereafter,) it will go far toward convincing farmers that our soil and climate are favorable for the cultivation of flax.

My third proposition was to show that flax was capable of being spun by machinery at less expense than cotton.

I have already remarked that when I arrived in Ireland, in 1823, they were in a *transition state* with regard to the cultivation and manufacture of flax. Mr. BERNARD'S report of the process pursued in the Netherlands, with regard to the cultivation and preparation of flax, was taking the place of their former process, and a Mr. CROSSTHWAIT, an eminent banker of Dublin, had established at Lucan, about seven miles from Dublin, a factory for spinning linen by machinery. This gentleman might, with propriety, be called the pioneer for putting in use machinery for spinning flax, and had he done it during the palmy days of BONAPARTE, would, undoubtedly, have been entitled to the one million of francs offered by him to any person who would invent a competent machine for spinning flax; but as it is, his name should be associated with those of WHITNEY and ARKWRIGHT, as a benefactor of mankind.

On the 12th of July, 1823, in company with Mr. CROSSTHWAIT, I visited his manufactory at Lucan. He was so polite as to take me through every part of it, and explain to me the different operations. At this establishment they dressed, spun, wove, bleached, and finished the cloth from five tuns of flax per week. The machinery for spinning was less costly than for spinning cotton. The spindles upon which the flax was spun turned about three thousand times per minute, or rather the flyer which surrounded it, and one girl tended about eighty of them, which spun from one hundred to one hundred and twenty runs per day. Mr. CROSSTHWAIT showed me about two hundred tuns of flax, a part of which was Russian, and a part Irish. The Riga flax, he informed me, cost him from fifty to sixty pounds sterling per tun, the Tandarage flax cost him eighty pounds per tun, equal to about eighteen cents per pound, while American dew-rotted flax, in New York, was only worth from eight to ten cents per pound. There was such a difference in the appearance of the flax here seen and any of our dew-rotted flax which I had ever seen in market, that I will attempt to describe it. First, the flax was all water-rotted; next broken by passing between small fluted rollers which only bent in one place at the same time, leaving both ends of the fiber free, consequently the fibers were not broken as when operated upon by our brakes, which are generally formed having two slats on the upper part, which press down between three in the lower part, by which a tension is produced which breaks a great proportion of the fibers, which draw out in the coarse hatcheling, and what we call *dressing*, by which twenty-five per cent. of waste occurs more than in preparing such flax as I saw at Mr. CROSSTHWAIT'S factory. This flax was simply broken as I describe, the shives or woody part shaken out as clean as may be when it is done up for market, no knife or hatchel used, as with us, to make the flax fine, and the more flat and plated the fiber lies the better they like it.

After the flax is taken from the bale, as imported, the dressing commences.. What was termed *dressing* at this establishment, was what we Yankees would call *hatcheling*. When the handful is taken from the bale, it has the receptacles of the capsules on the upper end, the same as ours when it comes from the brake, and also some coarse pieces, not entirely free from shives, at the lower end. The ends only are passed through a hatchel to separate these coarse particles, which are reserved for the manufacture of crash, and goods of that description.

I may as well state that the hatchels used at Mr. Crossthwait's establishment were different from those used by our farming families. The coarsest I saw somewhat resembled those seen in families where they formerly manufactured flax, with this difference, the teeth appeared to be twice as long, according to their size, and of steel, spring-tempered. A board is placed on the back side of the hatchel, coming up to about the middle of the teeth, so that the work is done on the upper half of the teeth, the points of which are made very sharp, and graded down to the size of darning needles; and although I did not see any finer than that, Mr. Bernard assured me that in the Netherlands they were made as fine as cambric needles, and as delicately sharp. This delicacy of point is necessary for the division of the fiber, which, when separate, is not as large as a human hair,—and yet it is a flexible tube. After the coarse ends spoken of are separated, and the flax passed to a finer hatchel, the operator holds his flax in his right hand, and as he draws it through the teeth, brings his left hand up in front, gathering any broken fibers which may be left projecting in front, drawing them out and laying them down straight at his left side, and so in all after hatcheling. This they call *short flax*, and is used for filling, as the longer flax is used for warp; hence there is very little waste in what we call *tow*. After the flax has been dressed as fine as they wish, it is then fit for the spinning process.

IV.—PREPARING, SPINNING, &c.

Eds. Rural New-Yorker:—To prepare flax for spinning it is divided, by weight, into small parcels, according to the size of yarn they wish to produce. The operator stands by the side of a long table, the leaf of which is hung upon hinges and turns upward. To the back side is attached a trough, made with an angle of 45 degrees. The end of this trough is near the spinning machinery. The operator takes one of the small, weighed parcels in his right hand, near one end, places the other end upon the table, putting his left hand edgewise upon the point of it, then extends his right hand to the right, when the left is again placed upon the point of the flax, at each time leaving a due proportion of flax upon the table. Practice enables the operator thus to extend his given weight of flax the length of his table very equally. The front leaf of the table is then raised, and the flax slips into the trough, from which it is drawn by the rollers of the spinning apparatus, and extended in a manner not unlike cotton. The machinery is more simple, and less expensive than for cotton.

Before machinery for spinning flax was introduced into Ireland, the yarn was spun by hand in families, and the yarn thus produced was taken to the Linen Halls, where it was examined, weighed, numbered, and left for sale. The weavers went to the Halls, selected and purchased their yarns for weaving, wove their cloth and carried it back to the Halls, where it was inspected, measured, numbered, and left for sale. The bleachers went to the Halls, purchased their unbleached cloths, bleached and finished them, when they were again carried to the Halls, inspected, numbered, stamped, and left for sale.

In the finishing their goods, the manufacturers had reference to the market for which they were designed. Those for the American market, after being bleached, were starched and passed through a machine called a calender, consisting of polished iron rollers pressed together by screws, similar to our plating mills, by which the threads were flattened down so as entirely to fill the interstices between the threads, and in some instances the rollers are pressed so close as nearly to cut the threads in two where they cross, much to the injury of the goods. Those linens designed for a home market receive a very different finish. After being bleached they are folded up and undergo what is termed the butting process, by which the linen, after being folded many thicknesses, is placed upon a smooth platform, where perpendicular shafts, having their lower ends made of lignum vitæ, and made smooth, and raised by cogs, are allowed to fall upon the linen, which the operator keeps moving between the blows, until every part of the cloth is made smooth. By this process the linen does not receive a polished surface, as when finished by the calender; and the threads appear as distinct as when it comes

from the bleach-field, and they are not injured by too close pressing at their crossing.

The amount of linen cloth manufactured in Ireland, in the year 1820, was 43,613,218 yards; in 1825, 55,113,265 yards; in 1835, 60,916,592 yards. This was not all made of flax grown in the kingdom, for it appears, by statistics, that England imported from foreign countries in the year 1845, to the amount of 79,424 tuns, valued at twenty millions of dollars. Previous to 1825, linen was mostly made from home-spun yarn. In 1839 there were in operation in England forty flax spinning mills, using steam to about 2,000 horse-power. In 1845 there were 414 linen factories, of 12,000 horse-power, giving employment to 48,000 persons. Three of these mills consumed 110,000 tuns of flax annually, and all employed a capital of sixty millions of dollars.

At the weekly meeting of the Council of the Royal Agricultural Society of England, February 12th, 1851, a paper was read, from which we make the following extracts:

"The total value of the flax fiber imported for manufacturing into linen, sail cloths, tarpaulins, rick covers, sacking, and other materials, exceeds £5,000,000 annually; and there is no doubt, judging from the rapid progress of our manufactures, that if the supply of the raw material could be more readily obtained at home, the consumption would be increased to a still greater extent. The progress of the linen trade, in consequence of the great improvements which have been made in machinery, has, within the last twenty years, been almost unparalleled. The exports of linen have increased since that time from 50,000,000 to 105,000,000 of yards, and its declared value, from £1,700,000 to upward of £3,000,000. No attempt, whatever, has been made on the part of our agriculturists to meet the enormous and rapid increase in the demand for the raw material; and, as a consequence, the foreign producer has been reaping a golden harvest from the monopoly which he has possessed. The imports of foreign flax have increased from 936,000 cwt., in 1831, to 1,800,000, in 1842—the value of the *increased* imports being not less than *two millions and a half*, nearly the whole of which is paid for in money sent out of the country.

"Hemp.—We also import large quantities of hemp, which might, like flax, be easily and profitably grown at home. The value of hemp annually imported is about £1,500,000. We have thus a demand existing for flax and hemp, and for the supply of which we are dependent upon foreign countries, shown in round numbers by the following figures:—Flax fiber £5,000,000; seed for crushing £1,800,000; seed for sowing £200,000; oil cake £600,000; hemp £1,500,000; total £9,100,000; equal to about forty-five millions of dollars."

The same communication takes a view of the existing demand for flax, as connected with the manufacture of cotton in England, and the sources from which they receive their supply, and also of the prospective market, consequent upon mixing linen with cotton. In this communication the writer says, "hitherto we have spoken only of the *existing markets;* I am now anxious to call your attention to that great demand which will be opened by *my* discovery of the mode of adapting flax to cotton and woolen machinery. The substitution of flax for cotton is now no longer a matter of doubt. Recent experiments at Rochdale have completely set that question at rest. Important as may be the considerations connected at present with linen manufactures, and cogent as may be the arguments deduced from them, in order to induce you to obtain possession of the ground now occupied by the foreign producer, infinitely more important, and far more forcible, are those which may be drawn from the prospective demand now springing up in our cotton manufactures. The consumption of the raw material must, of necessity, be governed by the machinery which exists for its manufacture, and the spindles of Belfast, Dundee, and Leeds, are already supplied with the produce of foreign countries. Not so, however, with respect to flax, and its adaptation to the cotton manufactures. Millions of cotton spindles are ready at once to take the raw material and spin it for you, without the slightest alteration being required in their arrangement. A thousand tuns of cotton daily, or 770,000,000 of pounds annually, are consumed in our cotton manufactures, and the results of my recent experiments

have been such as to show that flax may be substituted for at least one-half of this amount. In order, therefore, to supply this *new demand* for a *new material* thus created, the produce of 2,000 acres will be required for each day, and the whole of the flax grown in the United Kingdom does not amount to more than one-seventh of the supply required for Manchester alone. It is a duty imperative upon the agriculturists of the country to endeavor to meet this enormous demand, and not allow it to pass into the hands of foreign countries, which will inevitably be the case if they do not immediately exert themselves in this respect."

V.—GOVERNMENTAL AID—SOILS ADAPTED TO FLAX—QUANTITY OF SEED, &c.

HAVING given my views with regard to the cultivation and manufacture of flax in other countries, founded on my own observations, and information derived from respectable sources, and also as to the benefits already received, and those anticipated, let us now turn our attention to our own country, as to what has already been done in this branch of business, and what might be done provided our Government looked as well to the interests of the laboring classes as does the Government of England. But, I would ask, when has our Government manifested the protecting care over our manufactures that England does toward hers? Not only has that protecting care been witheld, but the vacillating course of legislation which has characterized our National Legislature has been such as to prevent free investment in manufactures by our own capitalists. And, in addition, it entirely prevented foreign capitalists investing in this country when they were so flooded with money in England that Consols, which is ever their standard, gave but three and one-third per cent., while in this country they were sought after at from six to seven per cent. I was often told by capitalists, while in England, that were it not for this vacillating course of legislation, growing out of party strife, we could be furnished with all the capital we could employ in manufacturing, at a smaller interest than was current in this country. So much for the rancorous party feeling in this country, which has now brought us to the verge of ruin. It has served to keep us in the rear of other nations, when, had it been otherwise, we might, in many branches of manufacturing, with our boundless resources, be far in advance of them. It has had a tendency to keep us a consuming people, depending upon foreign manufactures for many articles which could, under a different policy, be produced at home at a cheaper rate. It has made us buyers and consumers of many important articles, of which we should have been the manufacturers and exporters. As a case in point, I recollect to have heard Governor SEWARD,—who, I believe, is looked upon as one of the few remaining statesmen living at this day,—at a public speech which he made in New York, say that "he had known of instances where iron for our railroads was purchased in England, the cost of transportation of which, from the place where it was made to the place where it was to be used, was greater than would have been the cost of manufacturing it upon the line of road where it was to be laid."

It is not exactly so with linen, because that is of easy transport; but when we consider the vast extent of country we have calculated to produce as fine flax as any in the world, with water-power enough to drive all the machinery in the universe, is it not mortifying to think we depend upon England for most of the linen cloth we make use of, when the same money which we have paid to them, had it been properly employed at home, would have produced more cloth than we imported? Let us look at some of our imports.

In 1842 we imported linen to the amount of $3,659,184; in 1844, $4,492,726; in 1848, $6,644,648; total, $14,796,558,—equal to $4,932,186 per year. Who will pretend that had this amount of money been judiciously expended in this country in machinery, material and labor, it would not have produced as much linen as we imported? Then Cotton was King. We exported cotton and imported linen.

I believe that it is now generally admitted by those most conversant with the cultivation of cotton at the South, and flax at the North, that, all things being equal, an acre of flax at the North, properly managed, will give as great a per centage net profit, as an acre of cotton at the South. If this is so, what prevents our farmers

at the North from going into the cultivation of flax, as we see there is already an unlimited market abroad for the raw material, and there will, undoubtedly, be a home market as soon as it is seen that the quantity produced will justify erecting machinery for its manufacture.

As the season is approaching when farmers are preparing for their crops for the coming summer, we would recommend that every farmer should prepare for sowing at least one acre of flax. Many may think that flax seed is too high to begin this year. The very circumstance of flax seed being so high is encouraging for producing it. Both seed and oil produced from it are high in this country and in Europe, which is proof that the produce is not equal to the demand, and as there are no indications of a decrease in the demand, either in this country or Europe, we think the increase of one year's crop will not alter the price materially. Farmers should not wait for any encouragement from Government before they begin in this culture,—it never has done anything, as yet, to encourage the growth and manufacture of flax, and, in all probability, it never will. I was in Washington in 1830, at the time the last report of the Committee on the Manufacture of Linen and Hemp was made, which I have heretofore referred to, of which Committee Judge SPENCER, of Wayne county, N. Y., was Chairman, who told me that he did not think Government intended to do anything more than publish their report for the gratification of the farming community. I think Gen. TALLMADGE, of the American Institute, did more to encourage the manufacture of cloth from flax, by offering his gold medal, than ever our Government has done; and foreign croakers have so long declared that "this Government was better calculated to raise up swindling politicians than patriotic statesmen," that I think many begin to believe it. Yet I hope for better things. Although our Government has done some things, *apparently* for the benefit of the farmers, yet their execution, being entrusted to men either incompetent to carry out the wishes of the public, or too dishonest to expend the money for what it was appropriated, has proved most decided failures. For instance, the $75,000 a year for the purchase of choice seeds for free distribution in this country, proved a *decided imposition*, for never since the celebrated WM. COBBET came to this country, more than forty years ago, with the refuse and condemned seeds from the house of TURNER & Co., Regent street, London, has there been such an assortment of worthless seeds distributed, as of late, and I think CHARLWOOD, of London, could tell a similar story, if he pleased, to that told by TURNER & Co., respecting the outfit of WILLIAM COBBET. I will admit that I received a large number of packages of seeds from the Patent Office, free of postage, all marked, "*Selected by our Special Agent in Europe*," or labels to that effect; among which the only package I received that was of any value was half a pint of "*Red-Eyed China Beans*," which were worth seventy-five cents per bushel in this market, and I had good reason to suppose that they were not *imported*, from the slovenly manner in which they were put up.

I have thus digressed from the subject of the cultivation and manufacture of flax, in order to show farmers the fallacy of their looking to Government for any aid in the cultivation or manufacture of flax, and that they must depend upon their own individual exertions for success; but from present appearances there can be little doubt that those who sow upon good ground, well prepared, and properly managed in all the after manipulations, will make flax a profitable crop. Land that produced a good crop of corn last year, and the ground kept clear of weeds is, very suitable for flax; so also are grounds that were cropped with potatoes, and well tilled.

Particular reference should be had at the time of sowing as to the use for which the crop is designed. If for seed only, from one bushel to one bushel and a half will be found sufficient; if for lint, from two to four bushels per acre should be sown, according to the nature of the soil.

Flax should be pulled as soon as the stalks turn yellow and the leaves fall freely from the stem and two-thirds of the bolls have turned brown, tied in small handfuls, and set upon the buts to dry. The next process is the rippling, or separating the seed from the stalk. This is done in several ways in this country, by passing through strong hatchels, whipping upon stones, or by the flail.

VI.— WATER-ROTTING, BREAKING, HATCHELING AND BLEACHING.

Eds. Rural New-Yorker:—The next, and most important part in the preparation, is the water-rotting. This is done in the Netherlands by placing it in ditches. A bank is formed in one part of the ditch, the side being at about an angle of forty-five degrees. A tier of the small bundles of flax are then placed reclining upon the bank. Mud is then scraped from the bottom of the ditch with a long-handled wooden scraper up to the top of the flax, which is placed with the roots downwards, as they claim that the tops require more rotting than the bottoms. In this manner they proceed until they have deposited their crop, when another bank is formed of sufficient height to allow the water, when the ditch is filled, to cover the top of the flax. The ditch being filled the flax is allowed to remain from five to ten days, according to the temperature of the weather and water. After about five days the flax is examined, by taking hold of the top of a few stalks and pulling them out, when, if the fiber separates freely from the stalk, it is considered watered enough; if the fiber still adheres to the stalk it is allowed to remain longer, always being careful not to have it over watered, for if it is rather short it can be finished upon the grass, when if over watered it is materially injured.

When the flax is properly watered, the operator commences at the end of the ditch where he left off, takes hold of each small bundle, and pulling them over, rinses off the mud, and sets them upon the bank of the ditch but-end downwards, to drain, after which the bundles are unbound and the flax spread upon short grass to dry, and bleach, preparatory to the separation of the fiber from the stalk, or shive. In this process the gum and mucilage, in which the fiber is imbedded, is dissolved, and separated from the fiber; whereas, if spread directly upon the grass, before watering, the gum and mucilage becomes oxidated, and so hardened as to become insoluble in water, rendering the fibers less flexible, and more difficult to separate one from the other, and more difficult to bleach

Next comes the breaking process. In this operation, by whatever machinery it is performed, care should be taken that the fiber is not submitted to such tension as to break it. The common brake in use among farmers is a bad instrument, having two slats on the upper part, passing its opening between three slats in the lower part. It will at once be seen that by this formation a greater tension of the fiber is caused than would be if the upper part of the brake had only one slat passing between two in the lower part, and the process would be nearer like that performed by passing between fluted rollers which is the more common method in most of the flax-growing districts in Europe. Purchasers in manufacturing districts consider that sample most perfect which approaches nearest to that stripped from the stalk by the fingers without disturbing the flattened fibers as they come from the stalk. Where the rotting process is well performed, and the breaking skillfully done, and the shives well shaken out, nothing further is required, only that the fiber is to be laid straight and bound up in suitable bales for market. It should not be twisted and doubled up, as has been the custom with our dew-rotted flax, with which every process seemed to be an exertion to see how worthless we could make it.

Where machinery is used other than fluted rollers, the best that I have seen is a cylinder about the size of a barrel, about a yard long, with slats in the periphery of the cylinder, with knives projecting at right angles from the axis of the cylinder. Parallel with the cylinder should be a board of hard wood, over which to pass the flax endwise against the revolving slats. Another board should be placed parallel with the knives, over which the handful of flax, when first taken up, should have the tips passed, to separate the receptacles of the bolls, which may thus be scutched off without a material loss of lint. Taking hold of the tip thus freed from shives, the operator should next pass the points of the roots under the knives, to scutch off the hard points, when the handful is ready to be pushed against the revolving cylinder, the slats of which, as it breaks the stalks across the edge of the front board, separate the wood from the fibers without breaking them. The coarse lint thus thrown off is suitable for manufacturing crash. By scutching the ends, as

here recommended, there will be a small loss more than by the Russian mode of preparing it, as they leave the ends as they come from the brake, but I think this loss will be more than compensated by the quality of the flax. By whatever method the flax may be cleaned, the operator should always bear in mind that it is desirable to have the fiber lie in flat strips, as if pulled from the woody part by single stalks by hand, as it is then better fitted for the next process, which the manufacturers call dressing, but we Yankees would call it hatcheling.

The hatcheling process is one of the greatest importance. The first hatchel that flax is drawn through bears some resemblance to those used in families in this country, only the teeth are twice as long, according to their size, and the flax is not allowed to pass down lower than the middle of them. The teeth of this hatchel are not made very sharp, as the object is to get the fibers straight as possible, without breaking them. The next hatchel has finer teeth, with points as sharp as possible. Here the object is to divide the fibers one from another, and this gradation of the fineness of the teeth goes down, according to fineness of the flax required for a particular kind of manufacture,—as when intended for Brussels lace, it is finished on teeth as fine as cambric needles, with points as delicately fine, and through these teeth the flax is continually drawn, until it is divided finer than a human hair. In all stages of hatcheling, the broken fibers which are left in the teeth, with their ends drawn out in front, are taken in the left hand, and drawn out and laid down carefully, and are called "short flax;" and when the flax is for cloth, this short flax is used for filling, and the long fiber for warp.

After the fiber is made into cloth, the next process is the bleaching. I visited, in 1823, one of the largest bleach-fields in England, and said at that time to be the largest in the world. It contained 200 acres of land, with a very smooth surface. The whole of this field, Mr. Reynolds, the proprietor, told me he often had covered at the same time. Attached to this field were all the necessary buildings for storing the cloth, and machinery for carrying it through every operation of bleaching and doing up for market. The first part of the process was what was termed "bucking." For this purpose the cloths were packed in large vats, and caustic potash lye was pumped upon them, and allowed to filter down through them, and was drawn off at the bottom of the vat. By the process of bucking, all the coloring matter was removed from the cloth, with the exception of a faint tinge of iron from the potash. This, Mr. Reynolds told me, could be readily removed by using diluted muriatic acid, but that it was found to injure the cloth, and it did not sell as well as grass-bleached. He informed me that his cloths commonly remained from six to eight weeks upon the grass, whereas, he said, the same effect might be produced in America in as many days, owing to the difference in the sun's rays. He told me that at one time he had it in contemplation to remove his bleach-field to America, as he thought he could bleach his cloth and return it to the London market in a shorter time, and less expense than to bleach it there, owing to the difference in the intensity of the rays of the sun in the two localities, and that he could bleach as much upon a twenty-five acre field in America as he could upon his two hundred acre field there. Again, as his potash was all brought from America, the freight on that would in part offset the freight on his cloths, and that the difference in the cost of power for driving machinery, in favor of America, would be equal to the remaining freight. The cloths at this establishment were mostly finished by the butting process, as very few of them were designed for the American market.

I have thus run slightly over some of the leading features of the Cultivation and Manufacture of Flax. I leave it to the farmers to draw their own conclusions, whether they will engage in the business, with or without the patronage of Government. N. G.

REPORT ON

FLAX AND MACHINERY FOR MAKING FLAX COTTON.

BY A COMMITTEE OF THE N. Y. STATE AGRICULTURAL SOCIETY.

[At the Annual Meeting of the New York State Agricultural Society, held in Albany, February 11, 1863, the following Report on the subject of Machinery to Test the Experiment of Manufacturing Flax Cotton, was submitted, and the Resolutions which follow it were subsequently adopted by the Executive Committee. Though not strictly on the subject of Flax Culture, the Report discusses several matters pertinent to the objects of this Manual, and is considered of sufficient importance to occupy a prominent position therein:]

I.—History of the Effort.

The Legislature of the State of New York, in the Supply Bill for 1862, made an appropriation of two thousand dollars, to be expended under the direction of the State Agricultural Society, for the encouragement of those who were seeking by machinery to test the experiment of manufacturing Flax Cotton.

In order to promote the objects of the Legislature, the Society issued a circular inviting all who had been successful in "The Preparation of Flax as an Economical Substitute for Cotton, so as to be used on Cotton Machinery," to present their claims to a Committee of the Society thereafter to be appointed.

The only competitors for the State bounty were the Lockport Flax Cotton Company, Mr. Chas. Keep agent, and Mr. C. Beach, of Penn Yan; whereupon the Executive Committee appointed the undersigned to make an examination of their respective methods of accomplishing the object, and report the result to them.

The Committee met at Lockport on the 6th day of January, where they had the pleasure of meeting Gov. E. Dyer and Mr. Albert Briggs, a committee from the Rhode Island Society for the encouragement of Domestic Industry, which has offered a large reward for the discovery of a method for cottonizing flax, and has in other ways stimulated the inquiry, and roused public attention to its importance. We were greatly aided in our inquiries by the intelligent experience of these gentlemen.

II.—The Flax Plant—Soils Adapted to It.

The flax of commerce is known to botanists as the *Linum usitalissimum*, which is the typical plant of a small family known as the *Linaceæ*. There are several varieties of it, but that most commonly used in this country, as well as in Europe, is the blue-flowered variety.

It can be raised with more or less success on a wide range of soils and climates, but it is most profitably grown on light, dry loams, with

a subsoil so constituted as not to permit the water to stagnate round the roots, while it is sufficiently tenacious to prevent too rapid drainage. We subjoin the following analysis of two soils in the district where the best flax of Belgium is grown:

By washing, 100 parts were found to consist of

	No. 1.	No. 2.
Clay	9.00	8.00
Fine sand	91.00	92.00
	100.00	100.00

By analysis:

	No. 1.	No. 2.
Water	3.80	1.85
Organic matters	4.48	3.25
Silicious matters	87.04	91.80
Peroxide of Iron	1.96	1.16
Alumina	1.52	1.22
Carbonate of Lime	0.96	0.55
Carbonate of Magnesia	0.27	trace
Alkaline salts	0.20	0.14

The excellence of this Belgian soil must, however, result mainly from its mechanical properties, as it is deficient in some of the most important elements which enter into the composition of the flax plant. The Belgian farmer, however, is well known to be liberal in the application of manures, and skillful in their adaptation to the specific wants of soils and plants. The soil is thus supplied with any missing element by the art of the farmer.

The composition of the soils upon which the best Irish flax is raised, is thus stated by Sir ROBERT KANE. They were light clay loams:

	No. 1.	No. 2.	No. 3.
Silica and Silicious sand	73.72	69.41	64.93
Oxide of Iron	5.51	5.29	5.64
Alumina	6.65	5.70	8.97
Phosphate of Iron	.06	.25	.31
Carbonate of Lime	1.09	.53	1.67
Manesia and Alkalies, with traces of muriatic and sulphuric acids	.32	.25	.45
Organic matters	4.86	6.67	9.41
Water	7.57	11.48	8.73

These soils, though containing a larger proportion of the elements of flax than the Belgian, are deficient in the phosphates.

We are not aware that any fertile flax soils have ever been analyzed in America, but the following analysis of flax by Mr. SALISBURY, showing the amount of the matters derived from the soil which are contained in one tun of flax, will show clearly what soils are best adapted to its growth, and the manures necessary to correct any deficiencies which may exist:

Proportions.

1. Sun-dried flax	100.00	grs.
Dry	91.42	"
Water	8.58	"
Ash	1.80	"
2. Flax seed	100.00	grs.
Dry	92.72	"
Water	7.28	"
Ash	3.70	"

1st.—Analysis of Straw and Fiber.

Silica removed in a tun of straw	2.272	lbs.
Earthy phosphates removed in a tun of straw	7.037	"
Carbonate of Lime	7.696	"
Magnesia	0.812	"
Potash	7.838	"
Soda	2.374	"
Sulphuric Acid	1.042	"
Chlorine	0.133	"
	29.204	lbs.

2d.—Analysis of Flax Seed.

Silica removed in every 100 lbs. of seed	0.666	lbs.
Earthy phosphates removed in every 100 lbs. of seed	1.757	"
Carbonate of Lime removed in every 100 lbs. of seed	0.007	"
Magnesia removed in every 100 lbs. of seed	0.003	"
Potash " " " "	0.669	"
Chloride of Sodium removed in every 100 lbs. of seed	0.743	"
Sulphuric Acid removed in every 100 lbs. of seed	0.279	"
	4.124	lbs.

The manurial substance most likely to be required by the soils of this State to fit them for profitably raising flax, will be the earthy phosphates, since if each tun of straw bears ten bushels of seed, we see from the above table that seventeen pounds of the earthy phosphates will be withdrawn from the soil by each crop.

After all, the great majority of farmers will most easily understand the kind of soil best adapted for flax raising, when they are told that soils best adapted for barley are the best also for flax, and where maximum crops of the former are found to grow, maximum crops of the latter may be certainly calculated on.

III.—The Cultivation of Flax.

The most essential condition for the profitable growth of flax is good drainage, either natural or artificial. It is a waste of labor and money to sow flax seed on land where water stagnates round the roots. The next is, to plow the land deeply, and to pulverize it thoroughly. The

roots of flax will, unless prevented by a hard subsoil, penetrate full half the length of the straw into the ground, and the length and size of the straw, other things being equal, will depend upon the length of the root. Hence, if the farmer fails to fulfill these conditions, he will incur a heavy penalty.

The seed should be of the growth of the preceding year, plump, heavy, glossy, of uniform size and color, of a clear brown hue; if there are many seeds of a light-drab chocolate color, the lot should be rejected. The seed to be sown varies in amount, according to the quality of the soil and the portion of the crop which is deemed most valuable. Rich soils require less seed than poor ones, and where the production of seed is the principal object of the farmer, a smaller quantity is sown than where the lint is the chief object. When the culm begins to branch, its value as flax ceases; hence, that flax straw is most valuable which has the greatest length between the root and the branches. Thin sowing increases the tending to branch—thick sowing diminishes it. Where seed is the principal object, one bushel is sufficient to sow on very rich lands, or one and a half bushels on poor soils. When lint is the chief object, three bushels of seed should be sown.

Weeds, which are well known to be injurious to all growing crops, are peculiarly so to flax. No pains, therefore, should be spared to purify the flax seed from all foreign admixtures; and with a view of burying the seeds which have lodged on the surface of the soil, beyond the reach of germination, the plowing should be done with a Michigan plow, which more completely inverts the surface than any other; it is also desirable that the sowing should be suspended long enough after the plowing to give the seeds of any weeds which may be in the soil time to germinate. They are then to be killed by the cultivator, when the seed should be evenly sown and harrowed, once in the line of the furrows, and once angling with them, so as to diffuse the seed equally; the field is then to be rolled smooth.

Many good farmers think it is for their interest to weed the field by hand after the plants are from four to five inches high. This is done almost universally in Ireland and Belgium. Where weeding is resorted to, care should be taken by the workmen to avoid any rotation of their feet. They should be set down and taken up perpendicularly, and the weeding should be done facing the wind, which will then assist in raising the trodden-down plants. It is necessary that the land should be level, for if thrown into the ridges the straw matures unequally; it should be smooth, so that the crop can be gathered with a reaping machine.

Soon after the bolls are formed, the lower leaves begin to fall off, and the straw becomes yellow from the bottom, about half its length upward, when it should be pulled or cut with a reaping machine very close to the ground; if it is suffered to stand much longer than this, the straw is materially injured. The seed is then to be separated from the straw by means of a rippling machine. It is very desirable that the seeds should be completely separated from the straw, because if any of them are left on, they are crushed in the breaking machine, and where the oil comes in contact with the fiber it is almost impossible to separate it from the *shive*.

It is very desirable that the connection between the farmer and the flax should terminate at this point, as the remaining process can be much more beneficially conducted by others.

IV.—Causes which have hindered the Production of Flax.

It is certain that in many of the great barley districts of Central New York, which are also the great flax districts, no flax whatever is now grown. It is also the opinion of the most intelligent farmers, that its culture has been greatly diminished within the last twenty years.

Owing to the great and obvious mistakes and deficiencies in the census returns, it is difficult to verify this opinion, or to ascertain the amount of the diminution.

We think the most reliable statement contained in the census is that respecting the number of acres sown with flax, which gives 46,089 acres for 1845, and 11,764 for the year 1855. If we may rely upon this statement, there was a diminution, during the decade between these

years, of seventy-five per cent. We think the causes of this are as follows:

1. The want of a regular and remunerative market.

2. It has formerly been thought necessary to pull the flax by hand, which requires more labor than most farmers are able to spare at that season of the year. This has been a very great hindrance to the growth of it, but it need not be so for the future; it is now found, that when the ground is smooth and well rolled, it may as well be cut with the reaping machine, except for the very finest fabrics; in this case, a machine for pulling it has been invented, which executes the work with great rapidity and at a very small expense.

3. The rotting process is very unhealthy.

4. Few farmers understand the rationale of this process, and their practice is empirical, the result is therefore uncertain; sometimes it is not carried far enough, when the fibers are not separated; at others, it is carried too far, when the fiber is useless, because its tenacity is destroyed.

5. The operations of breaking, scutching and hatcheling are dirty and disagreeable, and are therefore repulsive to farmers and their sons.

6. Scutching and hatcheling can only be performed by skillful workmen, who are in all places difficult to be obtained in sufficient numbers to do any considerable amount of work, and in some places they cannot be obtained at all.

7. There has been a growing preference for cotton instead of linen fabrics for under-clothing and for bedding.

It will be observed that we have not enumerated the unprofitableness of the flax crop among the causes of its diminished production. Where a farmer has lands adapted to its cultivation, where he understands thoroughly all the processes, from the preparation of the land to the production of the dressed fiber, and where he has an adequate supply of skilled labor, and the requisite tools and fixtures, flax-growing even now is, we believe, one of the most profitable occupations of the farmer. It is because these conditions are so seldom united, that its cultivation has so greatly diminished.

V.—What is Needed to Increase the Culture of Flax.

The one thing most needed to extend the cultivation of this most important staple, is to create a market which will insure to the farmer a steady and remunerative price for his seed, and for his straw, just as it comes from the rippling machine, thus relieving him from all the processes for converting crude straw into dressed flax or flax cotton.

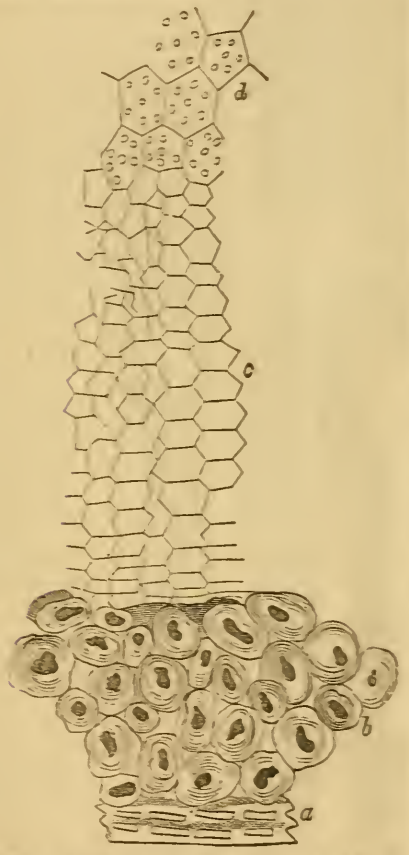
Since 1,500 lbs. out of every tun of straw is absolutely useless, it is obvious that the straw will not bear the expense of transportation to very great distances; if there is to be a market for the straw, there must be a *home* market. The producer and consumer must be brought side by side. Factories must be erected in the flax regions, which will strip it of its useless matters, and fit it for the purposes of the manufacturer, if they do not manufacture it themselves. We learned, during our visit, what we did not know before, that there were already several of these factories in operation, and that their number would be considerably increased next year, for the purpose of supplying a crude flax to the upholsterers and paper-makers, the demand for these purposes being considerably in advance of the supply. But should the process for completely cottonizing flax be perfected, the number of these factories will be vastly increased, especially in Central New York.

Such factories will surely be established whenever they are proved to be profitable. They will certainly be profitable whenever some solvent is discovered which will completely dissolve the cement, and reduce the bast tissue to its *ultimate* fabric, at a cost which will enable the product to be sold at the average price of cotton.

The great problem, then, is to discover this cheap solvent; it is to aid in the discovery of it that the Legislature has made its appropriation, and we hope it will continue to do so, until the goal is fully reached. When it is really solved, millions of dollars will be added to the wealth of the State, of which addition the farmers will receive the lion's share. We compute, from the data before us, that the value of the flax region of Central New York would be increased by at least ten dollars per acre.

VI.—The Structure of the Flax Plant.

On examining a horizontal section of the culm of the flax plant, we find a central rod of pith: around this is wrapped a cylinder of woody fiber: this, in its turn, is enwrapped by a cylinder of bast tissue, and this again is inclosed in an exterior cylinder of bark, or epidermis. The appearance of such a section, when magnified 400 times, is well shown in the annexed figure, copied from Prof. HODGE's report in the "Practical Mechanics' Journal:"



Slice of a transverse section of the stem of the flax plant, magnified 400 times its natural size. *a*, epidermis; *b*, liber fibers; *c*, woody tissue; *d*, pith cells.

It is only the bast tissue, marked *b* in the figure, that is of any value for manufacturing purposes: the central pith, the woody tissue, and the epidermis are not only useless, but very injurious, and the first object in the preparation of flax is to separate these portions *completely* from the bast tissue. We emphasize the word "*completely*," because if the smallest portion is left adhering to the bast fiber, not only the beauty but the durability of the fabric is injured.

We are of opinion that this part of the operation can be better and more cheaply effected by mechanical than by any other means; a very gratifying degree of success has already attended the efforts in this direction, and it seems to us, that the application of some obvious improvements to existing methods will accomplish all that can be desired in this respect.

VII.—Structure of the Bast Fiber.

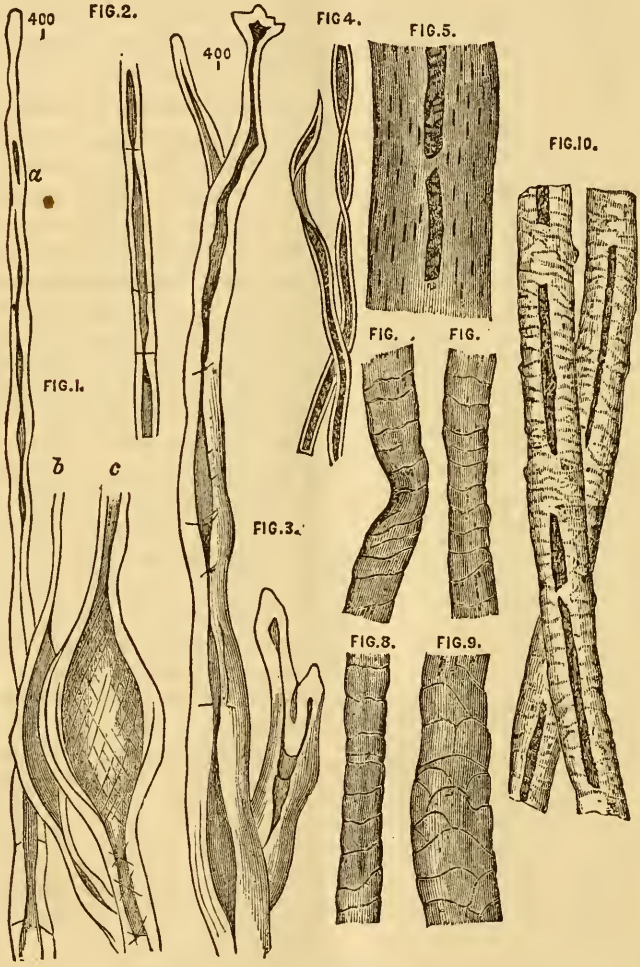
After the bast tissue has been thoroughly freed from foreign matters, much remains to be done before it is reduced to its ultimate fibers, and this reduction is by far the most difficult part of the process. This tissue consists of ultimate fibers, very nearly equal in length and diameter; at least they are quite as nearly so as those of cotton.

The figures on next page, from "Die Pflanzenzelle," by Dr. HERMANN SCHLACHT, will convey a clear idea of the microscopic appearance of the ultimate fibers of flax, and several other of our more important textile fabrics.

The fibers of flax are, as we have already said, uniform in length and diameter, and fusiform in shape, the ends being acutely pointed. It is essential that these characters should be preserved, in order that they may be spun successfully on cotton machinery. The process of CLAUSSEN for making flax cotton, which at one time was in such high favor, failed of success, because he attempted to obtain uniformity in the length of the fiber by cutting instead of separation: the stumpy ends thus formed were fatal to the success of his enterprise.

The fibers of the bast tissue are connected together by a strong adhesive nitrogenous cement, which has a very strong affinity for them; we believe that all attempts to overcome this connection by mechanical means must necessarily result in failure; such efforts are as absurd as to extract grease from cloth by mechanical means. The only means of separating them, is to discover some solvent which has a stronger affinity for the cement than the fibers of the flax. Whoever shall be the first to discover such a solvent, may exclaim with ARCHIMEDES, Eureka! An ample reward in fame and in money awaits the discoverer whoever he may be.

We have been thus particular in our statements, because we have had reason to believe that much misconception exists in the minds of many of those who are experimenting with a view of producing flax cotton. They have not clearly discerned that this involves two distinct and dissimilar operations, viz: the *mechanical* separation of the cortical and woody tissues from the bast, and the *chemical* solution of the cement in the latter tissue, with a view to the separation of its ultimate fibers. Some of them are spending much money and time in vain efforts to



Fibers of flax, hemp, jute, cotton wool, and alpaca magnified. Fig. 1, flax; 2, jute; 3, hemp; 4, cotton; 5, coarse long wool. Figs. 6, 7, fine Saxony wool; 8, 9, fine English wool; 10, alpaca.

effect both of these objects by machinery; others are wasting considerable time and money in equally vain endeavors to effect both objects by the discovery and use of chemical processes. We think that our chances for a successful solution of the problem will be greatly increased when all parties are brought to clearly recognize the fact that these two objects cannot be attained by the same, but by widely different methods.

VIII.—The Lockport Processes for Cottonizing Flax.

The Lockport Flax Cotton Company was incorporated in 1862, with a capital of $10,000, divided into two hundred shares of $50 each; it was subsequently increased to $15,000, which, with $10,000 more, has been expended in machinery and fixtures. Their mode of operating is as follows:

First — The Breaking Process. — The dried straw, as it comes from the farmer, is laid in thin sheets upon an endless apron, which conveys it forward to the machine, which consists of seven pair of top and bottom fluted rollers, following each other successively, the first pair being eight inches in diameter, with a pitch of two inches; the last, five inches in diameter, with a pitch of three-eighths of an inch. They are so geared that the last pair move with twelve times the velocity of the first pair. Each pair of rollers is held in contact by the action of screws and powerful India rubber springs. The bottom rolls are driven by gears and the top are driven by friction from those below.

The passage of the straw between these rollers produces the following results:

1. The round culm is flattened by their pressure.

2. By this flattening, the woody and cortical portions are split lengthwise into narrow portions.

3. By the fluting of the rollers, these portions are broken crosswise.

4. By the draft of the rollers, the bast tissue is to some extent torn asunder, and a portion of broken *shive*, or *boon*, as the woody and cortical portions is termed, are detached and falls down beneath the machine. By this process about 30 per cent. of weight is lost.

Second — The Dusting Process. — This is effected by passing the lint, as it comes from the breaking machine, through two rapidly revolving cylinders armed with spike teeth, similar to an ordinary thrashing machine, or "willow" of the cotton manufacturers. By this operation:

1. Another portion of *shive* is detached from the bast tissue.

2. This tissue is still more split up. Thirty per cent. of weight is lost by the dusting operation.

Third — The Scutching Process. — This machine had not arrived when we were at Lockport, having been detained on the railroad. It is inteuded by this machine to separate a still further portion of the *shive;* it is expected to take out six per cent. of the lint which is passed through it.

Fourth — The Second Dusting.—Which takes out about one per cent. more.

Fifth — The Combing Process.—This operation is too complicated to be described without reference to a diagram. Those who are familiar with old worsted combing machines, will have no difficulty in understanding it, as it is exactly similar in principle. This effects three objects:

1. It detaches about one per cent. of shive.

2. It lays the fibers parallel to each other, and gives them a slight twist.

3. It separates the longer from the shorter staples, to some extent.

Sixth — The Steep. — The combed flax is steeped in tepid water for 24 hours.

Seventh — Boiling. — It is now boiled in soap-suds and soda lye for 12 hours.

Eighth — Washing.—Water is poured upon the fiber and thrown off centrifugally, by means of a hydro extractor.

Ninth — Bleaching.—1st, steeped in a solution of chloride of lime; 2d. washing; 3d. squeezing; 4th. steeped in dilute sulphuric acid; 5th. washing.

Tenth — Solvent Process.—Dipped in a solution of alum, borax and salt.

Eleventh — Washing —In water holding a little sal soda in solution.

Twelfth — Drying — By exposure to a current of warm air which has been warmed by passing over steam pipes.

Thirteenth.— Scutching as in third process.

Fourteenth — Lapping — On an ordinary lapping machine.

Fifteenth — Carding.— There are eight carding engines, each of which turns off about 100 lbs. per day; from the cards a railway head conducts it to the drawing frames, which are like the ordinary ones, except that the top rolls are of iron or steel, and fluted like the bottom rolls.

IX.—Estimate of the Expense of the Lockport Prices per tun.

Straw	$10.00
Breaking	1.00
Dusting	50
Carding	75
Scutching	75
Second Dusting	50
Combing	1.00
Washing	50
Chlorine	6.00
Washing	50
Acid	45
Washing	50
Drying	1.00
Lapping	75
Salting	1.00
Washing	50
Carding	1.00
Drawing	50
	$27.20

We have not verified these statements, which are exclusive of rent, interest, fuel, insurance, taxes, repairs, and cost of superintendence. They are just as we received them from the company.

The product of one tun of straw is about 300 pounds of flax-cotton, and 300 pounds of lint, suitable for mixing with wool.

You will be furnished with specimens of the product after each operation, and can therefore judge for yourselves of the result.

X.—The Penn Yan Process.

The crude straw is thrown upon an iron disk, four feet in diameter, which is made to revolve forty-five times in a minute. Two wooden cylinders, eighteen inches in diameter and twelve inches long, roll upon each end of one of the diameters of the disk; they are powerfully pressed upon it by means of screws and India Rubber springs. The fiber is carried under these rollers by strongly curved hooks placed on the face of the rotary disk, grooves being cut in the rollers to permit their passage.

On the diameter, at right angles to the crushing rollers, are two beating cylinders, eight inches in diameter, armed with teeth three inches long, which revolve 1,200 times in a minute. The straw is first cut into lengths meant to correspond to the length of staple desired, and is dropped into the machine from above. This cutting process we think objectionable, as it leaves stubbed ends to the fiber. This, Mr. Beach hopes to overcome by the use of saws in a cutting-box, which was not in operation when we saw it, nor do we think the results will prove satisfactory. The result of this operation is, that each particle of lint is alternately crushed and beaten ninety times in a minute. Each charge is acted upon fifteen minutes, and the portions of shive detached are thrown out through a wire screen at the side of the machine.

The lint is now removed to another machine, where it is placed on an endless apron, which it forwards to a pair of fluted rollers. It is seized by these and brought into contact with a cylinder, the lags on which are three inches wide, and are covered with leather, through which tacks have been driven. The openings between the lags are two inches wide, through which a powerful current of air from a fan is directed on the fibers, which have been caught on the tacks from the feeding rollers, and which detaches a portion of the *shive*. The fiber is then thrown from the tacks on the opposite side of the cylinder, by the current, on an endless wire apron, which carries it to the front of the machine, where it is detached by a brush cylinder. This completes the process so far as we saw it, though Mr. Beach is devising additional means not yet completed. A specimen of the product will be forwarded for your inspection.

XI.—Opinion of the Committee.

The Executive Committee of the Society having reserved to itself the distribution of the bounty of the State among the various claimants, our duty would would seem to end when we have faithfully observed the facts, and truthfully reported them; yet as we have been informed that our opinions would be acceptable, we state frankly that we do not think that either of the parties have produced flax cotton in such a form as to be spun upon cotton machinery. In the best specimens of the Lockport flax cotton you will find particles of *shive* adhering; the fibers are irregular in length and in diameter, and by careful manipulation you will find that almost every fiber can be further divided, which shows that the cement is imperfectly dissolved.

The lint made by Mr. Beach, at Penn Yan, contains more of the *shive*, and the fibers are less minutely divided than in that made by the

Lockport company. As it was produced in our presence, we should hardly suppose that it could have been operated on by cotton machinery; but Mr. Beach showed us samples of roving and yarn made from the mixture, as he assures us, on cotton machinery.

We are fully convinced that the reduction of flax-fiber to flax-cotton is *practicable*. Already great strides toward the accomplishment of this have been made, as we think, in the right direction. We feel confident that nothing is needed but intelligent and persevering efforts to achieve a triumphant success.

We deem it desirable in the highest degree that the Legislature should continue to offer a reward with a view of stimulating and encouraging the activity and ingenuity of inventors. In case such appropriations are continued, we would respectfully suggest that the object should be made more specific, as 1st. —— dollars to any person who within the year 1863, shall bring into operation the greatest mechanical improvement for separating the "*shive*" or "*boon*" from the bast tissue of flax. 2d. —— dollars to any person who within the year 1863, shall discover the most perfect solvent for the separation of the bast tissue into its ultimate fiber; to be awarded by the State Agricultural Society.

XII.—Suggestions.

It is very obvious that the woody and cortical tissues can be broken and detached much more easily when in a dry than in a damp state. It therefore seems to us that sufficient care is not taken to insure the perfect dryness of the straw before breaking.

We are of opinion that more care should be taken to separate all the *shive* from the fiber before resorting to chemical agencies. We think the bleaching of the fiber is quite an unnecessary expense if it does not aid in the separation of the fibers, i. e., we do not think bleaching necessary with a view to the whitening of it.

It seems to us that our experimentalists have too much neglected Mr. Schenck's method of steeping the flax in warm water at ninety degrees, with Mr. Pownall's improvements in exposing the steeped straw to the pressure of a pair of smooth iron cylinders, while at the same time a stream of water is made to flow upon the rollers, so as to wash away the softened organic matters which adhere to it.

These suggestions may be of little value, but as we all concur in them it may do no hurt to offer them to the consideration of those who are seeking to solve the mystery of flax cotton.

If the Executive Committee should adopt the principle of giving any portion of the bounty of the State to meritorious, though unsuccessful competitors, we think such portion would be worthily bestowed on Mr. Beach. He has been for many years engaged in the enterprise upon which he has expended much labor, time, and money, without any returns whatever.

The Lockport company have already succeeded so far as to make a fiber practically useful to an extent which we think will prove highly remunerative to them. They have cheerfully afforded at all times such information as they have acquired, to all comers. They have contracted with as many farmers of Niagara county as desired to do so, for their crops of flax-straw at ten dollars per tun, and by their enterprise have made a home market for farmers which will prove of great value to them. Such enterprise, and such results, are, in our opinion, well worthy of public encouragement and reward.

It may be interesting to many farmers to learn that the average crop in Niagara county last year was one tun of straw and fourteen bushels of seed to the acre.

All of which is respectfully submitted,

Samuel Campbell,
John Stanton Gould,
Alfred Wild.
} *Committee.*

February 10, 1863.

ACTION OF THE EXECUTIVE COMMITTEE.

The Executive Committee, on the 10th and 11th of February, considered the Report which had been presented by the Committee. Mr. Beach was present, and was heard before the Committee, and Messrs. Campbell and Gould, of the Committee, were also heard, in answer to inquiries made of them. After mature delib-

eration on the subject, the Executive Committee unanimously adopted the following resolutions:

Resolved, That in the judgment of this Society no such advance in the perfection of machinery to test the experiment of Manufacturing Flax Cotton has been made as to warrant the Society in awarding any portion of the sum appropriated by the Legislature, at the present time.

Resolved, That the Society will keep the execution of the trust reposed in them by the Legislature in abeyance for the present, under the hope that such valuable improvements may be effected in the coming year, as may justify the Society in awarding the whole or some portion of this amount to any such successful inventions.

Resolved, That the Committee be requested to continue their investigations during the year, at such time and manner as may, on consultation with the President and Secretary of the Society, be deemed advisable.

Resolved, That the entire sum of two thousand dollars, appropriated by the State as aforesaid, now in the hands of the Treasurer of the Society, be deposited by him in one of the trust companies of the city of New York, where it may draw interest until required for the purpose designated by the Legislature.

Resolved, That the proceedings of the Society be presented to the Honorable Legislature.

B. P. Johnson, *Secretary.*

ABOUT FLAX--SOIL, SEED AND CULTURE.

[From the Rural New-Yorker of April 4th.]

I understand the Editor of the Rural to ask flax-growers to give the best mode of culture. Now, I cannot say mine is the best, but such as it is I will try to give in my imperfect style. I have had experience for more than forty years, and for the last twenty have raised from two to five acres, (generally about three, that being enough for my use,) and in good seasons have pretty good crops—last summer full as good as any. The weather was wet just in the right time for it to grow. It gets its growth in the shortest time of any crop that I know of. It might be called a ninety-day's crop, for from the time it is sown it will do to harvest in that time. But we will let that go, we won't harvest yet.

Now for soil and seed, and the way to fit the soil. I think any land that will grow a good crop of any kind of grain will grow a good crop of flax. If too rich the flax will be apt to fall down and spoil, if not pulled soon; and if too poor it will be short and not fit to pull; but it can be cut with scythe, cradle or machine. I sow one bushel of seed to the acre. If the ground is plowed in the fall as soon as it is dry enough, I in spring harrow until it is mellow and fine, then sow on the seed as even as possible; then harrow very lightly, or if very mellow take a light bush so as not to bury deep.

I get from eight to sixteen bushels of seed, and from 200 to 450 pounds of dressed flax, dressed by hand. The acre that will produce the most flax does not always produce the most seed. Sometimes, if it grows very large, it will fall down on account of wind and rain, which will lessen the yield of seed more than it will the fibre.

If the ground is plowed in the spring, harrow, roll and harrow until it is in fine condition; then sow as before. Any farmer will know when the work is well done. Some tell of plowing very deep and sub-soiling, so that roots can grow half as deep in the ground as the length of the straw, (or stalk, as I call it.) Well, you may mellow the ground as deep as you please, the flax roots won't grow any deeper than they please, which will be about three inches, and the flax grows three feet, which was about the length of mine last year. I think I will say no more upon the matter now, but before time to harvest I will give you my experience in that, which has been something, and the way I think the best.

Darien, Gen. Co., N. Y., 1863. S. Edson.

HEMP AND FLAX IN THE WEST:

AMOUNT GROWN, MODES OF CULTURE, PREPARATION FOR MARKET.

BY CHARLES D. BRAGDON, OF ILLINOIS.

With the time at my disposal, and the space accorded me in this work, I cannot hope to render this paper an exhaustive one on either of the subjects of Hemp or Flax Culture. My aim shall be rather to furnish some hints of practical value and interest, especially to Western cultivators; for the conditions of soil and climate which prevail here are in many respects distinct from those of the East, and the relations of the producer to the manufacturer and the market are certainly unlike, and equally important in the discussion of these staples.

PART FIRST—HEMP.

According to the United States Census, the following is a statement of the number of tuns of hemp produced in the Western States in the years 1850 and 1860, respectively:

STATES.	Dew-rotted.		Water-rotted.		Oth'wise prepar'd.	
	1850	1860	1850	1860	1850	1860
	tuns	tuns	tuns	tuns	tuns	tuns
Illinois,	----	----	----	----	----	----
Indiana,	----	----	----	----	----	1
Iowa,	----	----	----	----	----	----
Kansas,	----	44	----	----	----	----
Kentucky,	16432	33544	1355	2026	----	4344
Michigan,	----	----	----	----	----	----
Minnesota,	----	----	----	----	----	----
Missouri,	15968	15789	60	1507	----	1972
Ohio,	100	----	50	----	----	3
Wisconsin,	----	97	----	15	----	244

In the earlier years of the last decade, considerable Hemp was grown in Illinois; but its culture was abandoned, and other products substituted which were found to pay better. More attention was paid to stock growing and feeding. But with the present prices of Hemp it is believed it will pay to produce it—especially among small farmers who find a diversity of products essential. A great deal of Hemp is now imported for cordage and other uses, and in the shape of linen. We have soils and climates in the West quite as well adapted to its production as any that can be found in Europe; and the machinery that now exists adapted to the wants of the Hemp grower, removes one great objection to its culture which has heretofore obtained in the West. It is deemed important that some attention should be paid to it in this work on Flax Culture; and that it should occupy this place in its relation to flax, because it is an excellent preparatory crop for flax. Again, the machinery in use for the preparation of flax fiber for the manufacturer is, or may be, adapted to the preparation of hemp.

GROWING HEMP FOR SEED.

At this writing, hemp seed in our market (Chicago,) is selling at three or four dollars per bushel. There is quite a demand for it, and the prospect is that the demand will largely increase. It is important, then, and it will be found profitable, that farmers plant it for the seed. The soil should be well prepared, as for corn—the ground marked off in rows three and a half or four feet apart each way, and the seed planted in hills like corn, as early in the season as corn is planted.

Six to eight seeds should be put in a hill,—

two quarts of seed will plant an acre. Cultivate as for corn. When the plants are eight inches high, thin out to three or four plants to the hill. As soon as the sex of the plants can be distinguished, the male plants should be pulled, except here and there one, which is necessary to impregnate the female with its pollen. The male plant bears pollen, and is called "blossom-hemp;" the female bears seed, and is called "seed hemp." When the seed is mature, the plants should be cut, dried and thrashed. The thrashing is done by a flail or a stout stick, the seed winnowed, and put in bags or barrels for market. It should be kept dry. By this means twenty-five bushels per acre is easily grown. With the prospective supply and demand, it will be a very good business the present season (1863,) for the farmer who can get the seed to grow it for next year's market.

THE SOIL FOR HEMP.

It may be safely asserted that any good corn soil is a good hemp soil—will produce good hemp. A soil which bakes is not so well adapted to its culture. It needs to be deep, warm and dry. There are few of our upland prairie soils that will not produce good hemp. The low, alluvial soils, full of humus, cannot be recommended, because the quality of the fiber is not so uniformly good as is grown on upland soils. The hemp grows tallest on the bottom lands, but the fiber is coarse, weak and harsh; while on the upland prairie the lint is fine, soft and strong.

PREPARATION OF SOIL.

The soil should be well drained, deeply plowed in the fall - if subsoiled all the better —and again in the spring, and thoroughly pulverized by harrowing; and if cloddy, by rolling. The deeper it is plowed, and the better it is drained, the better will the plants stand the drouth, and the greater and more uniform the growth.

THE BEST SEED

Is that grown on plants cultivated as described above. If that grown on the crop sown for the fiber, is used, and is sown successively, it will deteriorate as above intimated. The fact is, however, if the lint is cut when it should be, the seed will not be worth saving—will not be mature. There are parties who sow a small quantity of seed per acre, broadcast, let the seed ripen, and save both the seed and lint resulting. But the experience of the oldest cultivators condemns this practice.

THE AMOUNT OF SEED

That should be sown per acre, depends alone upon the character and condition of the soil. The lint being the crop sought for, the quantity of seed should be such as to insure the greatest growth, and best quality of fiber. The quantity usually sown ranges from one bushel to one bushel and a half to the acre, depending upon the strength of the soil. If not enough seed is put in the ground the plant grows strong and coarse, and the fiber is inferior; if the seeding is too thick for the strength of soil, the length of the fiber is diminished. The plants do not grow of uniform length, and, while they do not contribute to the value of the crop, certainly absorb the food which should have aided in the development of the balance of the plants. To get the amount of seed on the ground which will insure the most uniform length of fiber, the finest quality of lint, and the greatest aggregate quantity, requires a good deal of experience, and a thorough knowledge of the character and condition of the soil.

WHEN TO SEED.

It should be put in at the earliest moment possible, and have the ground in good condition to receive it. And it should be put in after danger from heavy frosts has passed. For the young plant is tender—is sensitive to frost, heavy rains and winds. Its growth is rapid at first; but after it is once established no ordinary frost will injure it. The range of time in the different latitudes where hemp is grown, may be set down as extending from the fifteenth of April to the 10th of June. In latitude 42 degs. it might be placed at from the 1st to the 15th of May, depending upon the forwardness of the season. There have been seasons when it would have been safe to sow it the 25th of April in this latitude.

One important reason why early seeding is

desirable, is that the lower the temperature in which it can be grown, the better the quality, and the greater the value of the fiber. The longer the time, *early in the season,* in which it may grow, the more valuable the product. A forced, rapid growth, weakens the fiber, and renders it coarse. A stimulating sun has the same effect as a stimulating soil. It is a fact worthy of the attention of cultivators, that the further North hemp is grown, the greater the value of the lint. The fiber of the Russian and French hemp is much better than that of Kentucky and Missouri, for the reason above given; while hemp grown as far north as Sangamon Co., Illinois, and water-rotted, submitted to government tests, compared favorably with the Russian hemp — exceeding, in strength, the standard fixed by government, in some instances as high as twenty per cent. Hence, it is believed that Central and North Illinois, South Wisconsin, Iowa, and a portion of Minnesota, may produce hemp of superior quality. Indiana and Southern Michigan may certainly do so.

HOW TO SEED.

It is a matter of not a little importance that the seed be evenly distributed. This is self-evident, when it is known how much the value of the crop depends upon uniformity in the growth of the plants. Too much care cannot be taken in the distributing and covering of the seed to insure this uniformity in germination and of growth. If the ground is moist, the seed should be lightly covered. Indeed, a light harrow and a roller are the best implements with which to cover it.

The seed in the ground, nothing more can be be done by the farmer until the

TIME OF HARVESTING.

He may have his crop injured by frost or storms; but if he has been careful in the preparation of the soil, and in selecting the time for seeding, there is little danger that he will be disappointed in witnessing a magical growth of vegetation. And in about three and a half or four months, more or less, from the time of seeding, the male or blossom-hemp will begin to turn yellow; the pollen pods will burst, clouds of pollen fill the air, and then the harvest should commence. These male plants ripen several days—a week or ten days—before the female plants, and it is the practice, in the hemp-growing districts, to divide the time; cutting the crop a few days after the male plants, and a few days before the female plants mature. Unless it is cut soon after the male portion of the crop matures, that portion of it, which constitutes about one-third of it, would turn black, decay, and be lost. The cutting should be finished before the seed is ripe, and the male hemp begins to die. If large areas are grown, it will be seen that it is important that it should be sown so as to ripen successively.

CUTTING

Is done with a hemp-hook or knife, — a tool something like a corn-cutter or scythe; a cradle made for the purpose, or with a reaper. The work of cutting with a hook is something like that of cutting corn. The left arm is thrown around the plants with a backward stroke, and cut at a blow with the hook, as one would cut a hill of corn. A "through," as wide as the hemp is long, is cut, the operator spreading the hemp, as he cuts it, behind him evenly. This is important, that it may cure, and the foliage dry and drop easily; for if it is bound with the foliage on, and damp, it will affect its value materially.

If the hemp is not too high, a cradle is used as in cradling grain. It is pretty heavy work, and to cut a half acre per day, with a cradle, is considered a good day's work. In the North-West neither the hook or cradle will be used. The reapers must be made to do this work. In Sangamon county, Illinois, Hussey's reaper has been used. The hemp, as cut with it, is made (by the use of a cane held in the left hand of the manager,) to fall back regularly upon a wooden apron, which, adjusted to pivots, can, by a "holt" with his right hand, be turned up and down similarly to the operation of a cart-bed, thus sliding the hemp off, and leaving the buts evenly together for binding. At this work, a driver and "manager," with a change of two teams of four horses or mules each is needed. The change is found necessary because of the heat at that season. In this way, with this machine, six to ten acres per day are cut.

In Kentucky and Missouri, a McCormick

reaper is used, with an attachment invented for the purpose of adapting it to this work. It is said to operate successfully. I learn, also, that a Chicago gentleman has invented an attachment which is to be put on one of the MANNY machines at Rockford, in this State, and used during the coming harvest to secure hemp crops which are to be put in in the north part of the State.

BINDING AND SHOCKING.

There is a difference in practice among different cultivators as to the length of time the hemp should remain spread before binding and putting in shocks. This difference depends upon the rotting process adopted. If it is to be dew-rotted, as is the practice in Missouri, it is of less

importance to cure it in the sheaf and shock; but if to be water-rotted, the sooner it is bound, after it begins to cure, the better. In either case it should not be left spread on the ground at all after the stalk is cured, but should be put in bundles and shocked. It is the practice to use a hook, (see figure,) which may be cut from the branch of almost any tree, with which to draw the hemp into bundles for binding. The operator reaches forward with the hook, inserts it in the hemp, and quickly draws it toward him, forming a bunch of suitable size for a bundle. The bunch of straw is raised from the ground, and the hook used to strike off the dried foliage of the plant. A few strokes do this business, and the sheaf is then bound. Another hand should follow and shock it in close, round shocks, tying the tops of the bundles together. The quicker this work is done after cutting, the cleaner and brighter the straw will be.

Cultivators who water-rot their hemp, bind it in bundles eight inches in diameter as soon as it commences to cure or dry, and set it up in shocks of about a dozen bundles. In shocking, the buts of the bundles should be set to the ground, inclining outward. In binding, great care should be taken to have the buts even. Hemp cured in the shock, in this manner, will be kept bright; and on our prairies, where there is a free circulation of air, it will cure readily.

STACKING.

As soon as possible after the crop is cured, it should be stored in ricks, barns, or securely stacked. This work should not be indifferently done; for the better the fiber is secured from exposure, the greater its value, especially if water-rotting is adopted. As good a shape as any for a hemp stack is to commence it small at the bottom, of triangular shape, increasing the size gradually up to the center, at which point lay out a projecting cornice, which will protect all below it, and top off the stack in the form of a cone. Then thatch the top with opened bundles of hemp. The stack bottom should be raised from the earth by rails, or brush, or boards, so as to secure it from the ground and dampness there. In this way the crop may be wintered securely if it is not thought best to put it in market. Any man, however, who knows how to secure grain well in stacks, or ricks, will know how to secure the hemp; and in the West, where grain is so generally stacked, detailed directions would be superfluous.

DEW-ROTTING.

The hemp is left in stack until the weather becomes cool—until the nights have become frosty. Hot weather must have passed before the hemp should be spread for rotting. The first of October is early enough, and some seasons it is too early in this latitude. When the time has arrived the hemp is taken from the stacks and ricks and spread on the ground where it was grown—spread thin, and left there to rot. It is not turned. When sufficiently rotted the stalks lose their hardness and sticky feeling. The lint begins to separate from the stalk; the fiber is sure to separate from the stalk in the middle, and cling to it at each end. It requires experience to determine when the fiber is sufficiently rotted; but the close observer will quickly acquire this knowledge.

When the hemp is sufficiently rotted it is gathered into bundles, as above described, and again set up in shocks. The tops are not bound. Care is to be taken to keep the fiber straight and even. The shocks should be carefully put up that the wind may not blow them down. If

carefully shocked it will receive little injury until warm weather again.

WATER-ROTTING.

Edward S. Cox, of Sangamon county, thus describes his process:—"For the purpose of water-rotting hemp, I have excavations made in the ground into which are built half a dozen framed vats ninety feet long, nine feet wide, and six feet deep, the tops being on a level with the ground. These vats are constructed by thirty six-by-eight-inch sills laid crosswise, at each end of which, six-by-eight-inch upright posts are mortiсed and keyed, and stayed at the top by an occasional cross timber. The bottoms, ends and sides, are planked with two-inch oak timber and ship-caulked. The bundles of hemp are laid crosswise the vats, which are filled to the top. Four strings of plank or rails are placed lengthwise the vats, across the hemp, over which, again, cross timbers are placed and confined at each end under cap pieces projecting from the top of the vat. Thus is the hemp firmly confined under the water. The vats are then filled with water from a cistern arranged for the purpose, and the hemp is completely submerged, the water rising six inches above it. The water for rotting the hemp is drawn from a creek near by, by means of three very powerful suction and force pumps, through cast-iron pipes, into a framed, planked and caulked cistern, fifty-six feet long, fifteen feet wide, and six feet deep, constructed above and at the end of the vats. This cistern, by the aid of the pump, can be kept filled with water, which can settle and become clear, and be let into the vats at pleasure.

The pumps and machinery for dressing the hemp are propelled by a steam engine, the escape steam of which is admitted into cast-iron pipes laid at the base of the vats, and the heat thus communicated raises the temperature of the water in the vat to ninety degrees Fahrenheit. With this temperature the hemp is rotted in from five to seven days, the glutinous, or cementing matter, which fastens the lint to the stalk, being dissolved by the process of fermentation, and the filaments of the wood becoming concrete and brittle, are easily broken and separated from the lint. At this time all fermentation has ceased and the water is unpleasantly stagnant. The water is now let off through plug holes at the end near the bottom of the vat, and passes off through a ditch into the creek. The hemp in a few hours is drained ready for throwing out. The confining timbers being first removed, the bundles of hemp are easily thrown out, two men emptying a vat in a half day—each vat holding stalk to make one tun of lint.

By this method of water-rotting the business can be carried on every month in the year, in winter as well as in summer, as the water can be kept of a uniform temperature by means of steam. The workmen are protected from wet by oil clothes. The business is not unpleasant or unhealthy.

From the vats the hemp is hauled to the drying grounds, when it is set up in shocks of three or four hundred each—a band being tied around the blossom ends to keep them from falling down. Then the old bands are cut and the stalks well spread, the buts to the ground, inclining outward. As soon as thoroughly dry it is bound in large bundles and secured in store sheds ready for breaking."

Where streams or lakes of soft water are numerous it may be rotted in them by confining it. The length of time required will depend upon the temperature of the weather and of the water. In September it will rot sufficiently in ten days. In cooler weather, it requires a longer time. With the specifications above given, gentlemen engaged in growing hemp may be enabled to erect vats, modifying the construction and arrangement so as to adapt them to locality and circumstances. Pure, soft water is almost essential to the greatest success in this process of rotting.

BREAKING.

In some localities the farmer markets the hemp without breaking it; if in the vicinity of a manufactory, where steam or water-power is used to do this work, it will be found better to avoid this labor. But if the staple is to be hauled a considerable distance it will pay to break it. This is best done in cold weather if done by hand. The hand hemp-brake is very

similar to a flax-brake, though larger. The under slats on the hinder end are sixteen to eighteen inches apart; at the fore end they approach within three inches of each other. The slats on the upper jaw are so placed as to break joints into the lower, as it is brought down on the hemp. In the hemp-growing districts experience has perfected these brakes so that they are adapted to the work. Manufacturers of implements would quickly supply a demand that might be made for them. Any carpenter can make one.

Hemp is broken as little as possible—only just enough to remove the shives. The brake is struck down upon it a few times, the hemp whipped across the brake to knock out the loosened, woody portion. Care is taken not to tangle the shives and the fiber of the hemp by too much breaking. It is not swingled like flax.

Mr. Cox, above quoted, describes his process of breaking to be as follows:—"Small bunches, having been first separated from the bundles, and the buts uniformly shaken together, are thinly spread upon a revolving endless apron, which passes the hemp between one set of plain and two sets of scolloped rollers of eight inches in diameter, which gear into each other. By these the wood is crushed, broken and loosened from the lint. From this machine the hank of hemp, with the but always kept perfectly square, is passed under a brake consisting of three stationary and two interplaying, smooth-edged iron knives, connected by two pitmans, rists and flanges, to a shaft driven by pulleys, by whose rapid motion the shives are effectually detached and stricken out from the lint. Finally the hank of hemp is held and spread over a rest, and receives the action of a square cylinder or scutcher, having four projecting knives or beaters, the rapid revolution of which thoroughly clears it of shives and tow. Thus prepared, the hemp is placed in an extended state, with the root-ends evenly together, into wooden boxes holding twenty-five or thirty pounds. The bundles are then tied firmly, pressed into bales of about five hundred and fifty pounds, well covered with bagging, and secured by cordage, ready for market."

UNROTTED HEMP.

With the present difficulty of obtaining labor in the West, it is desirable that a market be created for unrotted hemp. There have been manufactories in operation for manufacturing the unrotted article into cordage. It is claimed that a much better cordage is thus produced than can be made from the dew-rotted fiber. Until manufactories of hemp are established in the West, near the points of production, the ordinary farmer must dew or water-rot his hemp. A supply of the material will cause investment in its manufacture; and the imports of this article of consumption will cease. If, as it is claimed, the raw material can be profitably worked into cordage, making a better article than the dew-rotted lint, it will be a great gain to agriculturists to have such processes introduced—for it will diminish the cost of production without proportionally depreciating its market value.

DEW VERSUS WATER-ROTTING.

Where water is convenient and suitable, the steeping or water-rotting process should always be adopted in preference to the dew-rotting, because water-rotted hemp is worth nearly or fully double the dew-rotted. If communities of hemp-growers were to combine and erect vats and cisterns for this work, where the natural facilities do not exist, it would be found to pay—especially where large areas of it are produced.

PART SECOND—FLAX.

My duty, here, is not to give detailed directions for the cultivation of this plant, but to add to the instructions of an experienced grower such hints as may be of especial and practical value to the Western cultivator. I do this without knowing what Mr. Newcomb may have written; and if it prove that I have repeated him, this fact will account for it.

PROFIT OF CULTURE HERE.

Farmer's have found it profitable to cultivate Flax for seed alone, when one dollar per bushel was pledged them for the product by the manufacturer. The amount of seed produced per acre ranges from twelve to twenty bushels, sometimes more. Even this has been more

profitable than wheat-growing, on the average. In the past, however, little or no use has been made of the straw. It has, strange to say, scarcely been regarded of as much value as wheat straw, when really, for fodder, it is excellent for hogs and cattle — *one-fourth* of the weight of the dry straw being of a highly nutritious character. Now, the seed has appreciated in value, being quoted in this market at $3 to $4 per bushel. The increased demand for oil, the check on imports in consequence of our tariff, has caused the appreciation, and no cause is apparent why there should be any change that will materially affect the American farmer's investments in the prosecution of this branch of husbandry.

Added to the increased value of the seed, is the appreciated value of the lint for manufacturing purposes. Thousands of acres of flax have been grown in the West, annually, for the seed, and this valuable fiber has returned, unused, and unprofitable, to the earth again. It has been burned or used for litter, when, if proper attention had been paid to its manufacture by capitalists, it would have possessed double the value to the country, and afforded the farmer double the profit. Its culture cannot be too strongly recommended to Western farmers. There is a market for it now. The harvest-rotted straw, loose and tangled though it be, will bring five or six dollars per tun at the railroad stations. A like article, dew-rotted, will bring two or three dollars per tun more; and if straight, and bound, still more. And it is not unlikely that these prices will increase. But these are war times, and it is not safe to build upon such hopes.

SOIL.

There is no doubt that our dry, upland, prairie soils, if deeply plowed and thoroughly prepared, are equal to any in the world for the production of flax fiber. The soil should be rich, but not freshly manured. The best preparatory crop for flax is hemp, as before intimated. It cleans the soil, and fits it for the production of a fine quality of fiber. It is probably the *cheapest* way to clean the ground. But flax may follow any of the hoed crops.

SEED AND SEEDING.

The amount of seed is a matter of considerable importance in the production of lint. When flax is grown for the seed alone, the lint is of little value comparatively. Much of the flax grown is from seed loaned the farmer by manufacturers, whose interests are to have it cover as large an area as possible. It is rarely the case that more than a half bushel per acre is allotted to the farmer — three quarters of a bushel is a large allowance. It is far better for the farmer to *buy* his seed than to take it in this way. And it is a fact worthy of his attention that quite as much seed will be grown on an acre if a bushel and a half or two bushels is used in the seeding, and the value of the lint will be nearly or quite doubled. The amount of lint will be largely increased, also. In some of the flax growing regions of the Eastern States a bushel and a half is found to be the maximum quantity of seed that may profitably be sown. In the flax growing countries of Europe two bushels, and sometimes more, are put on the acre; and experiments in the West, with the heavy seeding, seem to indicate that more and better lint, and quite as much seed, will be obtained where two bushels are sown to the acre than if a less quantity is sown. But these experiments have not been sufficiently extended to warrant the assertion that such will uniformly be the case. I call attention to it that future experiments may be made, and the profit of heavy seeding determined. In North Illinois, with this heavy seeding, twenty bushels of seed and three tuns of flax straw have been gathered from an acre.

Another fact of much importance to farmers who may cultivate this plant for lint as well as seed, is this:— The seed grown in the West is not the kind of seed which should be sown where lint is the object. It has been grown for seed, and so little has been sown to the acre that it produces a spreading, bushy plant. And the continued light seeding with seed so produced has greatly depreciated the value of the fiber it produces, even when thick seeding is resorted to. The plant grows dwarfed and the fiber is comparatively coarse and not uniform. Seed should be secured, if possible, from localities

where flax is grown for the lint—where it has long been grown with this object. A fine quality of fiber will be obtained, and seed of quite as much value for all purposes will be secured. It has been suggested to me by a gentleman who has paid a good deal of attention to flax culture and manufacture, that our Agricultural Bureau at Washington, might do the country a service by importing seed, for general distribution, from some of the best flax growing regions of Europe. In Hungary there are estates noted for the fine flax which they produce. It has long been produced in these localities, and seed obtained from them would be of great value at the start. I hesitate to recommend the Department at Washington taking any steps in the matter; for its agents as often buy on their own account, Government paying expenses, more seed than they buy for the Government. But if this hint is acted upon by responsible parties, on their own account, it will be safe to insure them a full reward for their enterprise.

TIME OF SEEDING.

What has already been said under this head concerning hemp, will apply here. The earlier the seed is put in, with the soil in good condition, the better, that the plants may get the start of the weeds, and that its growth may be far advanced before the summer heats commence. In the West, on our open prairies, where the sun is so intense in its influence, the growth of the fiber is too rapid, and it is weak and inferior. Hence, early seeding and the more extended cultivation of this plant in the higher latitudes is urged. The seed should be uniformly distributed, and on our light prairie soils no harrowing will be found necessary to cover it; the roller alone should be used for this purpose.

HARVESTING

May be performed with the scythe, mower, or reaper, depending upon the convenience of the planter, and the condition of the soil and crop at the time of harvest.

It pays to do this work well—to do it in the best manner, and save both seed and lint in the best possible condition. If the weather is good at the time of cutting, it may be taken up, bound, shocked and cured in that shape. The less it is tangled and the more evenly it is kept, and the brighter it is preserved, the greater its value. As soon as cured it should be put under cover, or stacked.

It is the practice in the West to let the crop, as it is cut, lie upon the land and harvest-rot, and then thrash the seed with a machine. This practice renders the lint comparatively worthless; indeed, as before written, it has been regarded of but little value. But even this has a market value now; and if not too much rotted it will bring eight or nine dollars per tun in this market. If the straw is too much rotted the strength of the fiber is injured—sometimes destroyed; and there is great danger that it will be over-rotted where it is harvest-rotted in hot weather. If under-rotted it does not clean well, and hence its value for spinning is less than if well rotted. The difference made by buyers in favor of dew-rotted, reaper-cut flax straw, will pay well for the work necessary to do it, provided the labor is at hand. But the difference made by buyers, or manufacturers, is not so great as is the difference in its value to them. The cultivator who takes prime care of his crop, and puts it in good condition for the market should remember this, and demand the full difference in the cost of care and labor expended. It is important that the crop should be cut as close to the ground as possible in order that the full length of the fiber may be secured. It is one objection to cutting flax at all, that the fiber is abruptly cut, and does not spin well because it does not run as when in the natural condition. If cut very low this objection is removed, for the fiber runs out as it approaches the root.

ROTTING.

The processes of rotting, and the best time for rotting, are similar to that of hemp. Cool weather and clean grass sod, on which to spread the straw, are essentials in the dew-rotting. The flax, when half rotted, is usually turned over. A pole or rake handle is run under the seed end of the flax, and the swath tipped over, the root end resting on the ground. This is quickly done. When fully rotted, bind, set up, let it get dry, and then store it or press it in bales for the manufacturer. Remember that it is important it should be dry before it is sent to market, not

only because dampness defrauds the purchaser, but because it is difficult to work it in the machinery. It winds about and sticks to the cylinders, and makes an almost endless amount of trouble.

Where there is water, and it can be done, water-rotting should be adopted. It will greatly increase the value of the crop. There is less waste about this process, and the product is worth more. The remarks under this head with reference to hemp will apply here with equal force and pertinency. In the absence of streams or ponds, or other natural facilities, the small cultivator will have to resort to dew-rotting; but where large areas are cultivated in this crop, it will pay to *prepare* for water-rotting.

THRASHING.

The flail is an excellent tool with which to get out the seed, and a good, clean, tight barn-floor an excellent place on which to do it. It should never be thrashed on the ground. The seed is also removed by rippling through a hatchel — a wooden one, or one with iron or steel teeth. But in the West the farmers have not the patience of JOB, and something rapid will be required. Other modes of thrashing are practiced. The seed is sometimes taken off by the use of two rollers, with their ends set in sliding bearings, backed by springs to keep the rollers together. The flax is taken in both hands and passed down through the rollers until the bolls are broken, the seed dropping below.

Another mode is to remove the concave of a thrashing machine, fasten a bar in front of the cylinder to support the seed end of the flax bundle as it is held by the but end, and subject the tops to the action of the cylinder. With care, this last mode is expeditious and safe, and the value of the flax is increased because the branching seed ends of the stalks are removed along with the seed bolls.

The above hints are all that will probably be needed in addition to directions given in other pages, especially as all intelligent farmers take and read agricultural papers, in which the experience, practice and discoveries of practical men are recorded.

There is no doubt that the supply of flax fiber is going to stimulate the inventive genius of our people in creating machinery adapted to its preparation and manufacture. It is one of the great undeveloped sources of wealth in this country; and while this great rebellion costs the North blood and treasure, it is at the sametime creating a revolution of our industry, and awakening and developing sympathies and powers which have too long been dormant.

FLAX GROWING IN SENECA COUNTY, N. Y.

BY SAMUEL WILLIAMS, OF WATERLOO.

TWENTY-FIVE or more years ago, flax growing for the seed was a favorite crop with many farmers, to be followed by a wheat crop. The flax seed was sown early on a dry, well pulverized soil, and cut, like clover, with a scythe, early in August. As it left the land clear of weeds, it was immediately plowed, and prepared with little labor to be sown with wheat in September. The three oil mills at Waterloo, and another at Seneca Falls, then made a ready cash market for the seed, and the rough flax after being thrashed of its seed was readily sold to the flax-dressing machine here, for six dollars the tun, in its rough and tumbled state. In order to induce farmers to continue to grow flax seed, our oil makers supplied them with extra clean seed, and generally contracted for the crop of seed when grown.

The flax crop was even then profitable, notwithstanding the comparatively low price of the seed and rough flax. Still many farmers had a strong prejudice against flax growing, letting in a conceit that to grow such oily seed must necessarily take the strength out of the soil;

whereas agricultural chemistry tells us that oil is mere carbon, so common a substance as to be of little manurial value. According to LIEBIG, the carbonic acid of the atmosphere is capable of supplying all the carbon necessary for a maximum crop. It is hardly probable that the flax crop draws any harder on the nitrogen and phosphates of the soil, than the narrow-leaved oat crop. In fact, I have always noticed that it was oftener insisted on that flax was a very exhausting crop by those farmers who did not grow it, than by those who did. But the greatest discouragement to flax growing was the advent of the wheat midge, *C. tritici*. After the ravages of this insect had nearly put an end to wheat growing, farmers prepared to grow oats instead of flax. The soil did not require such nice preparation for this crop as for flax; the yield was large, the price always high, and in default of wheat straw, oat straw was a necessity to aid the farmer to carry his stock through the winter. WM. KNOX, the principal oil maker here, says that "after wheat growing began to be abandoned as a general crop, oats took the place of the flax crop."

But now, in the blessing of Providence, the midge has left us, and the wheat crop is again the great paying cereal crop of Western New York. Now, then, is the accepted time to begin again to grow flax, to be followed by the wheat crop. It is, also, still more encouraging to go into flax growing at this time, as flax seed has advanced several hundred per cent. It is now sold for seed at four dollars a bushel; and the rough flax has also been advanced in price by the improvements in flax-dressing machinery, and by the great dearth of cotton, to a very high price, which cannot fail to be realized for several years to come.

The scarcity of flax seed, and consequent high price, will alone prevent many farmers from flax growing this season. But one of our largest grain and stock growers, JOSEPH WRIGHT, will sow about twenty bushels of seed as soon as he can have the fields finely prepared to receive it. As it is his design to pull the flax, and make the most of both seed and lint, he will sow a bushel or more seed to the acre. When flax was grown mainly for the seed, twenty-two quarts only was sown to the acre. The flax was not pulled, but cut with the scythe, and gathered and thrashed like a seed crop of clover.

I was a little in arrear of the improvements of the age in an article in a late RURAL, when I said that the Irish pulled their flax green before the seed had ripened, depending on imported seed to sow for the next crop. Fifty years ago I well remember the continued export of flax seed to Ireland, when it was shipped in seven bushel casks; but the Irish have made such progress, both in agricultural and manufacturing science, since that day, that they now make the best of Irish linen from flax that has ripened its seed.

Since writing the above I have seen the foreman of the old flax-dresser here, and he says that the yield of rough mown flax in this region, was over two tuns to the acre; and that every tun yielded three bundles of broken flax, of three hundred pounds each, pretty well cleaned of the shives. This would give 1,800 pounds of textile material to the acre. The woody fiber left in it, he thinks, does not amount to 5 per cent. It is true that a large part of it is tow; still it is textile and capable of being spun into rope-yarn, if not for weaving. He says that there was a great demand for this rough flax in New York at $40 the tun. It was used both by rope-makers and upholsterers. At this time it would probably be worth twice or thrice as much as then.

Mr. COOPER informs me that the flax-dresser here is simply a cast-iron breaker of eighteen rollers, nine above and nine below. With the aid of two boys he has broken and packed into bundles three tuns of this rough flax as the daily average, but it was only a short time in the season that they could get the flax straw to work.

THE STRUCTURE OF TEXTILE FIBERS.

BY JOHN PHIN, AUTHOR OF "OPEN-AIR GRAPE CULTURE."

THE Animal, the Vegetable, and the Mineral Kingdoms have all been laid under contribution by man in his search for a fiber which may be easily worked into substitutes for EVE'S fig leaf. But, although the variety of fibers which may be used is very great, the practical efforts of mankind have been confined chiefly to Silk, Wool, Cotton and Flax. Fur, which is extensively used in felting processes, is not usually regarded as a textile fiber, and neither is paper-making a textile process.

Each of these fibers is most easily converted into proper fabrics by means of processes peculiar to itself, and which depend, in a great measure, upon the ultimate structure of the fiber operated upon. Hence the great value of an accurate knowledge of this structure in each case. If, for example, we were to apply to cotton the processes usually applied to wool, and which depend upon the felting properties of the latter, we would signally fail,—solely because the felting process requires, in the fiber subjected to it, elements which cotton does not possess, and the absence of which are easily ascertained by microscopical examination. A description, with illustrative figures of the various fibers, may therefore prove interesting to those who are devoting their attention to the production of substitutes for cotton.

FIG. 1.

SILK, as produced by the silk-worm, is a slender filament, remarkably regular in its size, though generally it tapers gradually from the outer to the inner end, as unwound from the cocoon. It possesses a smooth and lustrous surface, and consists of two cylindrical filaments, glued or cemented together, this structure being derived from the fact that the silk-worm or caterpillar possesses two spinnarets, from each of which one of these cylindrical filaments proceeds, and the two being brought together before they harden, they become united into a compound filament as shown in Fig. 1.

The filaments of silk are from 750 to 1,150 feet in length, and may be regarded as ready prepared threads, which require but to be united in proper numbers to produce an article suitable for weaving or for the ordinary purposes of the seamstress.

WOOL consists of a single cylinder, generally somewhat irregular in thickness, (though this feature, if excessive, is a serious defect,) and covered with numerous scales or imbrications which give it a snake-like appearance under the microscope. These scales or imbrications, in connection with its elasticity and tendency to curl, confer upon wool the peculiar property of *felting* — a property which it possesses in common with many kinds of fur. On examining the engraving, Fig. 2, it will be seen that these imbrications all point one way, like ratchet teeth. If, therefore, two of these hairs or fibers were placed parallel and close together, but with the roots and points lying in opposite

FIG. 2.

directions, the projections on one fiber would catch on the projections of the other, and while the hairs would easily slip past each other, in one direction, they would resist all such motion in the opposite one.

So well developed is this property in some furs that fabrics are made without the aid of spinning or weaving, and simply by mixing the fibers thoroughly in reverse directions, (as regards the points and roots,) so as to form a layer of loose flocks which the workman covers with a piece of blanket stuff, slightly moistened, and presses with his hands, moving the hairs backward and forward in all directions. Thus the different fibers get interlaced, by their ends pursuing ever tortuous paths; their vermicular motion being always, however, root foremost. As the matting gets denser, the hand pressure should be increased in order to overcome the increasing resistance to the decussation. A first thin sheet of soft, spongy felt being now formed, a second is condensed upon it in like manner, and then a third, till the requisite strength and thickness be attained, after which the fiber is subjected to the fulling process.

So, too, by fulling woolen cloth — that is, by the combined action of heat, moisture and mechanical blows, the fibers of wool get more and more thoroughly interlaced and the fabric shrinks in length and breadth, and increases in thickness. Hence, too, in washing woolen goods which it is desired should not shrink, they should be rubbed and worked as little as possible, since, if the fibers once get interlaced, it is very difficult to retract them.

In the ordinary processes of carding, spinning and weaving it does not appear that this peculiar feature in the structure of wool plays any important part. The success of these operations depends upon the elasticity of the fibers and upon the equality of their length and thickness. URE says that "the best length of staple for the clothing, or fulling species of wool, is from two to three inches. But Saxony wool, though four or five inches long, admits, from its tenderness, of being easily broken down by carding to the proper shortness, and is preferable, on account of its variable lengths, for making kerseymeres, pelisse cloths, shawls, and such fabrics as require fine yarn."

COTTON consists of the hairs which surround the seeds of various species of *gossypium*. In a growing state they are slender, round tubes, but when dried become flattened so as to appear of a twisted, ribbon-like shape, with rounded

FIG. 3.

edges. Fig. 3, which shows a portion of cotton fiber, exhibits this peculiar structure very plainly. These fibers are perfectly smooth, so that they do not felt in the slightest degree; but, owing to their elasticity, fineness, regularity and flexibility, they are more perfectly adapted to the various processes of carding, spinning, &c., than any other fiber.

Dr. URE gives the following beautiful illustration of these properties of cotton:—"If we take a tuft of cotton wool in the left hand, and seizing the projecting fibers with the right, slowly draw them out, we shall percieve with what remarkable facility they glide past each other, and yet retain their mutual connection, while they are extended and arranged in parallel lines, so as to form a little ribbon, susceptible of considerable elongation. This demonstration of the ductility, so to speak, of cotton wool, succeeds still better upon the carded fleece in which the filaments have acquired a certain parallelism; for in this case the tiny ribbon, in being drawn out by the fingers to a moderate length, may at the same time receive a gentle twist to preserve its cohesion till it becomes a fine thread."

FLAX.—The fibers of lint, as derived from the Flax Plant, (*Linum usitatissimum*,) consist of nearly solid, cylindrical filaments, jointed somewhat like a bamboo cane. That this is the real structure of flax we have no doubt. The annexed engraving, Fig. 4, representing a flax fiber, was drawn by means of the camera lucida, from the object under an excellent microscope, constructed

FIG. 4.

by GRUNOW, of New York, the power used being an objective equal to one-fourth inch focus, and magnifying about 190 diameters. The same appearances were found in lint from all sources; in that form mummy cloth, supposed to be 5,000

years old, and in "flax cotton" prepared by the most recent processes. Neither did we fail to find the same appearances under the most varying circumstances as to illumination and medium of immersion. Whether viewed by transmitted or by reflected light the fibers presented the same cane-like structure; and their being mounted dry, in balsam, in dilute alcohol, in glycerine, in water, or in any other mode, seemed to make no difference.

We have examined this subject thus thoroughly, because of the discrepant statements made by popular authors in regard to it, and because of its im ortant bearing upon the characteristics of flax as a textile fiber. Thus Dr. GOADBY, in his "Vegetable and Animal Physiology," has figured flax as consisting of a cylinder with a series of simple constrictions, as shown in a figure on another page, and which is copied from his work.

Dr. URE describes the joints alluded to, as parenchymatous rings, tying together the bundles of fibrillae, and says, moreover, that in his microscope, with a power of 300 diameters, the fibrils never show cane-like, furrowed joints, although they sometimes show cross lines at variable angles to the axis. He gives the diameter of the fibrils thus described by him as the 1-2000th of an inch. The diameter of the fibrils, shown in in Fig. 4, varies from 1-2880th to 1-1500th of an inch. It is therefore probable that our lint is as finely divided as his. But flax fibers vary in diameter much more than this. We have measured fibrils which we were satisfied were *ultimate*, and which measured the 1-650th of an inch,—and we have found fibrils as small as the 1-5000th of an inch, which showed the structure we have described as distinctly as a cane fishing-pole. Dr. URE further states that the parenchymatous rings which bind these fibrils in bundles, are soluble in weak potash lye. Such is not the case with regard to these joints. They show quite as distinctly after being boiled in *liquor potassae* as they did before.

On carefully examining the structure of flax fiber, as shown in Fig. 5, it will be seen that the various joints are not accurately in line, as they would necessarily be if the joints were mere rings slipped on to a continuous cylinder. Moreover, on breaking a bundle of fibers the fibrillae split off, as is very clearly shown in Fig. 5, which was drawn by the camera, from a mounted specimen under the microscope, and is not a mere fancy sketch. On attempting to break up a fibril (which is easily done,) it does not split

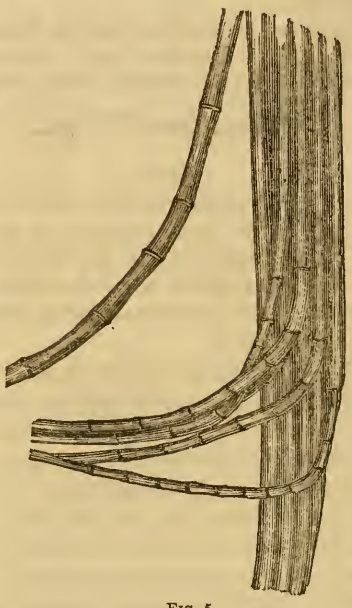


FIG. 5.

into lesser fibrillae, but breaks across with an irregular fracture. The fibers are also easily crushed or flattened, and when so flattened, frequently present, under the microscope, a bulged appearance, which has apparently given rise to numerous errors among popular authors.

In all the prepared flax which we have examined no fibers have occurred which appeared to be divided longitudinally for any considerable distance. In a few cases we have seen fibers crushed, and apparently split, and these *splits* have in some cases extended, continuously, beyond the joints. This, perhaps, suggests the possibility of still further dividing the fibrils, though by what means this could be accomplished it might be difficult to suggest. It is obvious, however, that if the lines of direction of the dividing or splitting force extended continuously beyond the joints, the same effect would be produced as by continuous lines of arrangement of woody fiber. But an examination of very many broken fibers, leads us to believe that the fibrils which we have described, do not possess any structure more minute than that shown in Fig. 4. This statement would be

most satisfactorily verified by a series of good drawings of the specimens from which our conclusions are derived, and at some future time we hope to present the subject in a more detailed manner.

SCHLEIDEN figures the cells of the flax plant as shown in the engraving, Fig. 6. Abundance of such fibers are found in the woody portion of

FIG. 6.

the plant, but we have failed to discover them in lint. On the whole, therefore, we believe that the ultimate fibers of flax possess the structure which we have described, and that but little hope need be entertained of the possibility of further division.

The peculiar characteristics of flax as a textile fiber are its hardness, strength, rigidity and want of elasticity. It is the latter feature, particularly, which renders it so difficult to work in all stages of its manufacture. Thus, speaking of the weaving of linen fabrics, Dr. URE remarks:—"The greatest obstacle of a practical nature to the introduction of the automatic weaving of linens, was the stubbornness or want of elasticity in the yarn, which caused frequent breakages and much confusion. In woolen or cotton goods if a thread or yarn should chance to be a little tighter than the others in the warp, its elasticity will allow it to come up to the general bearing of the others when the weft is struck up by the reed; but in linen, from the want of that elasticity, a thread so situated would break, and by crossing some others cause them, if not to be broken direct by that circumstance, at all events cause an obstruction to the shuttle that would lead to further mischief." This difficulty is felt with even greater force in the earlier stages. The mere length of fiber is by no means an insurmountable difficulty. Flax could easily be reduced to conditions similar, as regards length and tapering termination, to wool and cotton. But in the first of these fibers we have a slender filament, covered with elastic scales which readily yield, but at the same time confer a wonderful elasticity throughout a long range of flexure. And in the case of cotton we have a flattened tube, the matter in whose walls has been greatly extended when compared with the nearly solid, wooden cylinders composing lint.

To obviate these difficulties, in a measure, the Chevalier CLAUSSEN, after dividing the fibers of flax as minutely as possible, by means of his chemical process, mixed the fiber thus obtained with cotton to produce what he called "flax cotton;" with wool to produce "flax wool;" and with waste silk to produce "flax silk." That a judicious mixture of these various fibers would produce articles superior in some respects to any one alone there can be little doubt, and thus might be opened an available market for large quantities of flax. All the specimens of flax cotton that we have seen, however, have been pure lint—no finer than that frequently used in the manufacture of fine linen goods. The application of the term "flax cotton" to such materials seems to us a misnomer.

In the possibility of so preparing flax that it may possess the properties of wool or cotton we must confess that we have but little faith. It may not be for us to offer suggestions, and neither would we wish to damp the inventive ardor of the multitudes who are entering upon these investigations. It seems to us, however, that after having reduced flax to its ultimate fibers, (the processes for effecting which are no doubt subject to vast improvement,) our most feasible hope lies in the adoption of improved machinery for converting this fiber into the desired fabrics. That American genius is abundantly competent to effect this we have no doubt. As to its ability to convert a jointed, wooden cylinder, the 1-2000th of an inch in diameter, into either a flat ribbon, with rounded edges, or into a scaly fiber, permit us to retain some doubt.

FLAX AS A DOMESTIC INSTITUTION.

BY HUGH T. BROOKS, OF WYOMING CO., N. Y.

About the time the *piano-forte* came in, another instrument, worth two of it, went out. It was a bad exchange, judged by any standard of value known among men. The *piano*, polished and pretentious, claims your best room, disdains all menial duties and all plebeian associations, replies repulsively to strangers; but, as if to make its exceptional features more repugnant, responds to a favored few with utterances melodious as an angel's voice. Certainly, under such circumstances, the piano does not occupy a very "wide sphere of usefulness."

The *wheel*, known and distinguished as "the spinning-wheel," and further eruditely classified and subdivided into the "big wheel" and the "little wheel," was gotten up on a very different plan, modest, laborious and practical. Forced into retirement, like the Grecian sage by those it had served too well, it may still be found among fossilized remains in the garrets of our ancient farm-houses. Removed to a fashionable boarding school, it would at once be recognized by the pupils as having some mysterious connection with one of the "lost arts," and would be removed to a suitable receptacle for relics that have outlived their usefulness.

What precious memories cluster around this memento of former years! Soiled and sooty, lacking a spoke, limping in one leg, like your grandfather's chair, it shows the workmanship and proportions of other days. Everything about it betokens service. The legs are shortened by wear; the band's groove is well worn—gudgeons small, sockets large, and "*treadle*" scolloped by the constant foot of one, who, true to the manifold duties of wife and mother, spun the thread of her mortal life, and helped to weave the web of empire. Oh, "little wheel!"—you revive our remembrance of a noble race who grappled with the mighty problems of a new existence, solving at once the vexed questions of human liberty, social and industrial advancement. Animated by a strong religious faith, inheriting the spirit of adventurous sires, quickened to unparalleled effort by the incentives and opportunities of an undeveloped continent, they inaugurated an era of peaceful prosperity with no parallel in the world's history. Their enterprise laid broad and deep the foundations of a mighty empire, full of hope for the human race.

I am reminded that, being unable to repay our obligations, we ought at least to confess them, and to transmit unimpaired the fair heritage of freedom received at their hands. In this "*second* struggle for liberty," deadlier than the first, it is well that we review these memories—that we cultivate the virtues, and the *industries* that made our fathers invincible.

Now, as aforetime, necessity is upon the people to practice economy, develop the latent resources of the country, and by any and every means increase the supplies demanded by the armies in the field, and the people at home.

Since foreign goods are paid for, to a considerable extent, with the "precious metals," now doubly *precious*, and every purchase from abroad tends to increase the rates of foreign exchange, it becomes our men and our women to put forth every effort to augment our supplies by DOMESTIC MANUFACTURES.

It seems, therefore, an auspicious time to return to the cultivation and manufacture of *Flax*, especially as its great rival, Cotton, hard pressed by contending armies, has so far withdrawn from every-day life as to leave our wants, in a large measure, unsupplied. It is a matter of record, that for many centuries *flax* was mainly relied upon by leading nations for domestic clothing. Royalty was arrayed in fine linen; prince and peasant were clothed in vestments derived from the same source.—Egyptian, Grecian, Roman, Frank and Briton knew and approved it well.

It is only lately, that machinery suited to short staples, like wool and cotton, brought the latter article into general use, to the partial exclusion of flaxen fabrics. We have reason to hope that the difficulties hitherto attending the working of flax by machinery will be overcome; but if we shall be disappointed in this, we have the same means and methods that our fathers had.—Fortunately we have preserved wheels and looms enough to furnish *models*, and our mothers and aunts can show us how to use them. Let spinning and weaving be henceforth reckoned among modern "accomplishments;" let schoolgirls rival each other, not in the purity of their French and Italian, the correctness of their coloring and perspective, the elegance of their embroidery, but in the quantity and quality of the *tow cloth* they can spin and weave in a week. To this end let wealth lend its means and influence, social eminence contribute willingly, and all sober-minded people labor assiduously.

To what extent our national resources will yet be taxed, no one knows, but a people occupying a country like ours, in such a state of agricultural advancement—with orchards and vineyards, fields in a high state of cultivation, stocked with improved flocks and herds, with houses and outbuildings, and all the appliances of an improved agriculture—should deem themselves equal to any emergency. The same industry, the same high resolve that animated the men and matrons of '76 will perfect the work they began.

A GREAT SOCIAL PROBLEM.

The Culture of Flax rises to the dignity of a great social reform. As a branch of Domestic Manufactures it bears upon the great industrial problem which the increasing population of our country and the world renders every day more important and more difficult to solve. Hitherto, labor in this country has been in demand at prices deemed *good* by those who employ—deemed not so good by those who have tried the experiment of making one hundred and fifty dollars, or, in exceptional cases, two or three hundred dollars cover the various demands of landlord, butcher, miller, grocer, merchant, shoe-maker, woodman and doctor, for a numerous family. But grant that labor has been in demand at good prices, you will perceive that the labor demanded is that efficient kind that can go anywhere for a job, and do any kind of a job when it is found. There are, ever have been, and will be in increasing numbers, persons more or less infirm, not capable of doing a full day's work, and others who from family cares cannot leave home, and who need the avails of whatever labor they are able to perform. For such as these, and they are a great multitude, work that can be taken to their own houses, and executed as their health and strength, and demands upon their time will permit, is in the highest degree desirable. I have long been convinced that the great defect of our industrial system is this kind of work. For the want of it, multitudes, willing and anxious to do something, spend much of their time in idleness. Nobody need deny this. The population about here is comparatively comfortable or independent; but I positively know that there are multitudes of women, and some men, who would rejoice to be furnished with the kind of work I have described. How many women would gladly knit for small pay, if somebody would furnish the yarn! How many would gladly spin and weave for a part of the cloth, if somebody would furnish the wool, or flax, or tow? My experience as a farmer and wool-grower enables me to say positively, *very many*.

I know well that the spinning wheels did not stop, the looms did not stop, till we, the farmers —I blush while I record it—cut off the supplies. I agree with CALVIN, I think it was, that *man* is "totally depraved," but woman's sympathies are stronger than her inertness; she will not suffer her little ones to go in winter half clad, or supperless to bed, while she has a finger on her hands, and material to fabricate a garment or a meal.

Flax, in other countries, to a very large extent, and considerably in our own, has supplied the very want I have described. It is, pre-eminently, a *Domestic Institution!*—suited to the needs of a home population. Multitudes will welcome its return as the means of clothing their families, and feeding them, too. Many not now utterly destitute, who have the remains of what was once deemed a competence, see their supplies growing every day less; prospective want stares them in the face, and soon, with pride subdued, self-respect lost, and the incentives to honorable effort gone forever, will become chargeable upon the men of property, who often are reminded by the *poor-rates—determined to learn it no other way*—that they are related to the great family of man. Will they, for the love of GOD, or their kind, do what they can to see that all about them, young and old, strong and weak, have the kind of work that fits them best.

I know very well that we all claim the right to do what we will with our own — that farmers suspended flax, and sold their wool to speculators and factory men because they thought they "made by it." I fear that we are still too far off from the Millennium to ignore commercial considerations — that the pleadings of needy women will not turn the scale when a couple of pennies are at the other end; but I ask that we do not deceive ourselves by false and faulty calculations.

When a rise in the price of wool, and a fall in the price of cloth, sent "home-made" out of market, and made the good old-fashioned *tow breeches* strangers in the land of their birth, we went headlong with the current, not doubting that things were as they seemed. Well do I recollect the spread of this great heresy through the country. The truth of history demands that I should say that clergymen were among the first to put on broadcloth. They may have been preceded a little by Presidents, and Governors, and Congressmen. Lawyers were scarcely behind. Students of law certified their apostasy from their fathers' trades, by apostatizing from their fathers' garb. Merchants—a fair business transaction—advertised their goods by putting them on. Our Member of Assembly followed suit, and now and then a Justice of the Peace, and a candidate for Coroner. Finally, we all had to get married, bachelors excepted, in broadcloth. I knew a well-to-do farmer who borrowed a coat for the occasion, and after the ceremony, like a repentant sinner, returned to his integrity. Very soon, however, the rawest kind of a boy could not go a courting in "home-made," and then it was all over with us. This final catastrophe happened some thirty odd years ago, since which time the factories have had every thing their own way.

Calamities never come singly; elliptic springs, cigars, stove-pipe hats, thin boots, plaited bosoms, mustaches, found their way into the country — I do not speak for the cities—about the same time. Had we taken the "strategic line" of domestic manufactures, and held it, these other *raids* would never, in my opinion, have been ventured upon.

I very much hate to put an additional weapon into the hands of the other sex, they are so expert in using them; but I have a secret opinion that if we had kept the wheels and looms in good repair, furnished plenty of wool and flax to work them, and boldly worn their fabrics on Fourth of July's and Sunday's, to weddings and town meetings, our bills for ribbons, gaiters, lace, silks, French lessons, sulphur water, crinoline and cologne would have been materially lessened. Was it not to be expected that persons in sympathy with us would adopt our *habits*, with needed variations? I am half inclined to think that, as the lawyers would say, we are forever *estopped* from complaining of any feminine absurdity whatever!

Now this is of the nature of retributive justice. We would not feed the looms; we despised home-made fabrics; we disregarded the interests of the poor who wished to spin and weave, and raise flax, and we pettifogged the case by saying that *factory goods were cheaper—was that certainly so?* The other day I bought a factory-made pair of socks for three York shillings. For a whole week I indulged in the pleasing illusion

that I had made a good bargain. At the end of that time I put them on, and in three days I had to lay up for repairs. Ah, me! As I reviewed them carefully each successive morning, and saw them shedding their hairs, like a colt in the spring, and giving unmistakable indications of rapid decomposition, how fondly did my memory go back to the *socks of other days*, that you might hold up to the light, and pull, and push your fingers against, and view from whatever stand-point, and find them firm and thick and soft and warm. Dear, blessed, home-made socks! No wonder we don't live out half our days, wanting such socks as these. And yet I do not blame the wives, and sisters, and mothers, and aunts of this generation, for the lack of good socks. The fault is with the masculine fraternity, who have withheld the rolls and broke up the wheels. What is true of socks, is essentially true of other garments, from the "shoddy" overcoat, to the wrapper that dissolves with the first washing. A little *cheaper*, forsooth—a little dearer, most likely, in the end. So, then, the argument founded on humanity, merely backs up the argument founded on real economy. Much time goes to waste in families that might be saved by domestic manufactures.

If people are above want, if they dare to think that they have no need to acquire a knowledge of what might, under a change of circumstances, be their salvation, I will still honor our common nature by believing that many will look to the interests of the poor and dependent, and will devise work for needy hands; work that can be done at the fireside—work that will keep families together, children under the eyes of their parents, brothers in the society of their sisters, and sisters under the protection of their brothers; work that does not sever family ties, but binds in a holy union whom GOD has joined together;—such work is worthy of a Patriot's care and a Christians' effort to provide.

THE USES OF THE FLAX CROP.

THERE is hardly a crop grown that has greater utility, or that can be turned to so many uses as the flax crop. Every part of it can be made use of, not as ordinary crops, used for common purposes for which other crops may furnish a substitute, but used in the manufacture of those indispensable articles in general consumption for which but few substitutes are as yet known. It furnishes a fiber for the manufacture of fabrics, which, though not equal to cotton for many purposes, is nevertheless superior to it for most kinds of summer clothing, duck, table linen, bagging, drillings, &c. For the making of clothes where wool forms a part, flax is more desirable than cotton, as the fibers mix more completely, and the flax takes and retains the dying material more uniformly and permanently.

Although grown chiefly for its fiber, yet the seed will of itself pay the cost of raising the crop, and it can be consumed upon the farm or sold. In the former case it may be fed to stock to advantage, but in order to be rendered palatable, it must be mixed with other grain and ground, or boiled and mixed with meal, and given with cut feed. In the latter case, the oil is first expressed, and the refuse seed is then made into linseed or oil-cake, a most valuable provender for fattening stock. The refuse part of the stalk, after the fiber has been separated, can be used in the manufacture of coarse wrapping papers, also in making paper for roofing buildings, to which cement is applied, and sheathing paper for covering the walls of buildings before the clapboards are put on. The nicer qualities of paper could be profitably manufactured from that part of the stalk used in making cloths, if the material could be produced in sufficient amount.

Again, flax would form a good material for small twine, such as fish-lines and packing twine, as well as larger cordage, such as horse halters, clothes-lines, bed-cords, &c., &c. With suitable machinery for its manufacture, flax can also be made use of for other purposes, and the present indications are that it will again assume its former honorable position in our staple products.—*Selected.*

BOTANICAL DESCRIPTIONS OF FLAX AND HEMP.

BY PROF. C. DEWEY, OF THE UNIVERSITY OF ROCHESTER.

FLAX is the Saxon name of the well known and long cultivated plant, of the Order Linaceæ in Botany. *Linum* in Latin, *linon* in Greek, and *llin* (a thread) in Celtic, from which come the English words, *linen*, line, lint, are designations of the same plant. Its botanical name is *Linum usitatissimum* of Linnæus, as being the most common and useful in cultivation, from its excellent fiber for the manufacture of linen and thread. It is a native of Asia and probably of Egypt, and has followed the human family in their migrations. It was long ago cultivated, for PHARAOH arrayed JOSEPH in "vestures of fine linen," and "SAMUEL ministered before the Lord, a child, girded with a linen ephod," as was also DAVID. SOLOMON'S merchants brought *linen yarn* from Egypt "at a price." The vail of the tabernacle was made of "blue, and purple, and scarlet, and of fine *twined linen* of cunning work." Something regal and splendid seems to have long been attached to it, and the recent dressing of it into *Fibrilia*, a new formed word from the Latin, *fiber*, highly promotes its exaltation. This one species is cultivated, says a British botanist, in "North and South America, Europe, Asia, and Africa." There are several other species of flax, but only this is greatly cultivated.

The botanical characters of Flax are the following:—Sepals, petals, stamens, and styles, in fives regular and alternating; capsules five-celled and two seeded, or partially ten-celled, with seeds suspended and mucilaginous: stem branching above, with linear-lanceolate and alternate (sometimes opposite) sessile leaves; bark composed of strong, tough, long and jointed fibers. Flowers somewhat panicled, blue and beautiful.

HEMP is another Saxon name for a valuable plant, which the Greeks and Latins called *Cannabis*. It belongs to the Order, *Urticaceæ*, the Nettle family, and to the Sub-Order, *Cannabineæ*. This plant is *dioecious*, with its staminate flowers on one slender stem, never producing seeds, and its *fertile* flowers upon a larger; the latter yields the desired fiber, as the former dies soon after fecundation is effected while the latter continues to grow with great vigor. Indeed, the seed-bearing stem, in rich soils, grows to the height of twelve feet or more, and becomes at the base two or three inches in diameter. From the seeds grown on one stem are raised plants having either "fertile or barren flowers," but which of them can be ascertained only by their growth. The inner bark of the fertile stem is formed of very tough fibers. These are a few particulars of this important exotic, now partially naturalized in our country. It belongs to a very different class of plants from Flax, though so much alike in the constitution of the bark. Botanists describe it in the following terms, as *Cannabis sativa*, SOWN or cultivated Hemp.

Flowers dioecious: staminate or barren flowers, with five stamens and five-divided calyx small, solitary and axillary, cymous-panicled; fertile flowers in spikes, with entire calyx opening lengthwise on the side, styles two, caryopsis (seed) two-valved and inclosed in the calyx; stem erect and strong, with opposite, petiolate and digitate leaves, the leaflets five to seven and lanceolate, serrate, and three or more inches long.

As appropriate in this connection we give the following description of Woody Fiber from Dr. HENRY GOADBY'S valuable "Text-Book of Animal and Vegetable Physiology," published by D. APPLETON & Co., of New York:

"Of all the forms of cells, the wood and bass-cells are most important in the domestic economy of mankind. The 'bass-cells' are the longest of

all; their walls are generally very thick, and mostly much bent, but rarely marked with pores or spiral fibers; only in the silk plant (*Asclepias Syriaca,*) the *Oleander,* and allied plants, is a spiral striation of the walls observed.

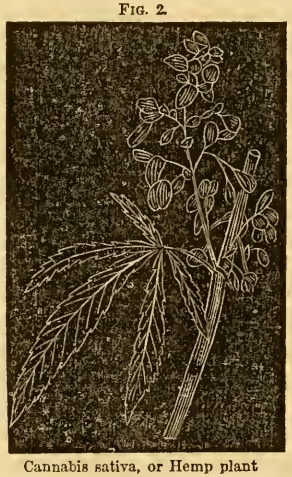
The materials used for ropes, cordage, linen, certain Indian muslins, mummy cloth, and mats, consist of the woody fiber of plants, from which the more delicate tissues have been removed by long-continued maceration in water.

Fig. 1.

Linum usitatissimum, or Flax plant.

Flax (or lint) is thus produced from the bark of *Linum usitatissimum* (Fig. 1,) hemp, from

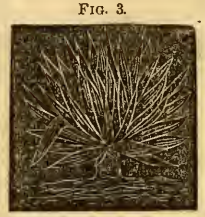
Fig. 2.



Cannabis sativa, or Hemp plant

Cannabis sativa (Fig. 2,) Zealand flax, from *Phormium tenax* (Fig. 3,) and bass (or *bast*) from the common Lime, or *Linden tree.* Fibers are also procured for manufacturing purposes from the *Pine-apple plant* (*Ananassa sativa,*) from *Yucca gloriosa,* from *Boehmeria nivea,* which yields the Chinese grass-fiber, from most of the plants belonging to the mallow and nettle tribes, and from some of the leguminous plants.

Fig. 3.



Phormium tenax. New Zealand flax.

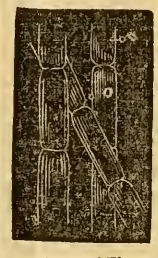
The tenacity of different kinds of woody fiber, as contrasted with silk, is given by De Candolle, thus:

Silk supported a weight of	34 lbs.
New Zealand Flax,	22 4-5
Common Hemp,	16 1-3
Common Flax,	11 3-4

If the maceration of the fiber be carried on to much extent, a pulp is formed from which paper is manufactured. In ordinary paper the vegetable structure is entirely destroyed, but in the Chinese *rice-paper,* which is not prepared by maceration, and in the paper of Japan, made from the mulberry, it is preserved.

The structure of flax, so largely employed in the manufacture of linen, is peculiar; and to guard ourselves against those manufacturers who employ (frequently) a large per centage of cotton, to be used in manufactures hereafter to be warranted 'all linen,' it is worth the while to examine it. If a linen thread be scraped with the thumb-nail to separate it into its primitive elements, or ultimate fibers, and placed under the microscope, an appearance will be presented like Fig. 4.

Fig. 4.



Fibers of Flax.

It will now be seen that we have a series of (apparently) solid, cylindrical, many-jointed fibers—the joints not very dissimilar to those of a bamboo cane; really, however, they are *tubes,* so nearly filled with solid contents that it is by no means easy to satisfy oneself of the fact. The outer membrane of the tube is structureless, although, occasionally, delicate transverse markings may be seen. These tubes are of great length, and usually pointed at both ends; they are also remarkable for their toughness. *Cotton* is not woody fiber, but simply the hair of the plant producing it."

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